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COST AND MANAGEMENT OF NUCLEAR SAFETY AND CLEANUP AND COMPLIANCE AT DEPARTMENT OF ENERGY DEFENSE SITES

HEARING

BEFORE THE

COMMITTEE ON GOVERNMENTAL AFFAIRS UNITED STATES SENATE

ONE HUNDREDTH CONGRESS

SECOND SESSION

WEDNESDAY, JULY 13, 1988

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COST AND MANAGEMENT OF NUCLEAR SAFETY AND CLEANUP AND COMPLIANCE AT DEPARTMENT OF ENERGY DEFENSE SITES

WEDNESDAY, JULY 13, 1988

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
Washington, DC.

The Committee met, pursuant to notice, at 9:30 a.m., in room SD-342, Dirksen Senate Office Building, Hon. John Glenn, Chairman of the Committee, presiding.

Present: Senators Glenn, Sasser, and Roth.

OPENING STATEMENT OF SENATOR GLENN

Chairman GLENN. The hearing will be in order.

I am releasing this morning two new reports by the General Accounting Office [GAO] that I requested on the major problem areas facing the Department of Energy's nuclear defense complex. These reports analyze those problems, DOE's organizational efforts to deal with them, and GAO's perspective on cost estimates for correction.

This is the first time we have received this kind of detailed information on cost estimates from both DOE and GAO.

These reports are the latest contribution to the work of the Governmental Affairs Committee in this area of oversight and investigation. For 3½ years, we have been trying to obtain information like this in our ongoing scrutiny of DOE's management of environmental safety and health problems throughout at the DOE defense complex.

On July 1, I released a DOE report prepared at my request as Chairman of this Committee, which contained DOE's estimated costs to complete needed corrective actions at the DOE nuclear defense sites, and to comply with current requirements for safety, health, and environmental protection. DOE's upper limit for such costs were $110 billion—B as in billion—and assumed an ongoing base program for environment, safety, and health that would last until the year 2045, well over the next half-century.

GAO's view of DOE's cost data suggests that the costs may be much higher than DOE's summary report suggests.

In particular, GAO believes that waste disposal costs of $45 billion should have been, but were not included in the DOE numbers. Also, GAO estimates that the cost of DOE facility upgrades needed for health and safety are $15 billion more than DOE estimated. Thus, if the DOE-estimated base-program costs of $26 to $40 billion

for routine operations beyond 1995 to keep DOE in compliance, are added to the GAO figures, the final estimated cost is not the $110 billion that DOE suggested, but more than $170 billion.

And I think most of us feel, having looked at this for some time for over several years, that is the long haul, this may be a conservactive estimate of the costs involved.

These numbers, while staggering in size, cannot be known with precision at this time. As the GAO report says, "The full extent of the problem may not be known and the level of cleanup necessary is uncertain."

I would say that I agree completely with that level of uncertainty, because, if nothing else, we don't even know for sure whether our current technology will permit us to do all the cleanup. How do you go into an aquifer that has been contaminated and clean the thing up? We are not even sure we know how to do it. The old axiom that "the solution to pollution is dilution" is the only way we know at this time to really clean up an aquifer that has been contaminated. You try and flood it with more water to flush bad things out. We may have to develop whole new techniques and do a lot of research on how we can accomplish this cleanup if our people are to be safe.

So, I agree with the GAO statement that the full extent of the problem may not be known and the level of cleanup necessary is uncertain.

In addition to its report on costs, GAO has updated its examination of DOE's management effort in dealing with the environment, safety, and health problems in the nuclear defense complex. It concludes that DOE's internal oversight organization is inadequate, that DOE has unclear safety standards, and that legislation is needed to strengthen oversight.

Last year, I introduced S. 1085, the Nuclear Protections and Safety Act, which was intended to address the issues flagged in this new report by GAO. A modified version of Title I of this bill has survived the House-Senate conference on the Department of Defense Authorization for fiscal year 1989 and will be enacted. It establishes an independent oversight committee to examine issues of safety, health, and environment at most of the DOE defense sites. And I would say that the version of Title I that passed, that will be enacted, is not nearly as strong or as broad as I would have liked. It has been weakened considerably since it started out. But, it is a step. It is a first step toward ending DOE's self-regulation on nuclear matters, self-regulation that I feel must end if we are to achieve significant and timely progress in this area.

As I have said a number of times, it will do us little good to protect ourselves from the Soviets by building nuclear weapons if in the process we poison our own people. And that is the bottom line.

It has taken us a long time to get this information. I do not want to interfere with, or hurt the weapons complex we have in this country. It is necessary, we know that. I have backed efforts to upgrade it over time. We have seen the whole complex reduced to a lesser capability than we would like to see it have. But, at the same time, it became apparent starting about 4 or 5 years ago, that during the last 35 to 40 years when this complex was built, that safety concerns for surrounding communities, concerns for

workers on the site, and the normal protections of safety and health and oversight that we provide in every other line of activity were reduced to second place because of our emphasis on production that we needed at that time. Now, we needed that production. But, because the programs were secret, because the bases were closed, because no monitoring was permitted, and when money got tight it was put into production and not into—at least some of it—into the areas of safety and health and oversight, we have let it go too long.

Now we have got to pay the piper. And that's where we stand today.

It is going to be a big bill. I don't think this administration has really addressed this.

I would say that we literally badgered the Department for going on 3 years to try and get figures. We finally got an agreement from them in this hearing room 1 year ago. We kept at it, and at it, and at it until in June of last year we were promised an estimate of the costs of cleanup by July 1 of this year.

We kept checking on a regular basis. That report has now been made. And it is a big bill. There are uncertainties in the GAO and DOE, and that is to be expected. I do not fault DOE for that necessarily, because these are difficult estimates to make. GAO, in including some of the other things, obviously comes up with a higher bill than did DOE on its own self-analysis. But these things have been let go too long.

We are endangering people on the bases. We are endangering workers. We are endangering people in surrounding communities. We just have to do this cleanup, and it is going to be monstrous. It is going to be expensive, but we have to do it.

None of the candidates have addressed this in any detail yet. The administration has not addressed it by actually putting some money into really starting to do something about this.

Because it has been let go too long, I drafted S. 1085. We wanted to see an outside oversight group that can give advice in this area. That was the purpose of that bill. Weakened though it may be, it is a first step.

Let me add that one of the areas of the country that is most affected by these problems is Hanford, Washington. The Senator from Washington, Senator Brock Adams, is with us this morning. We invited him to make a statement this morning since his area will be one of those most affected by whatever we do on cleanup in this area. We are glad to have him with us.

Senator, we are glad to have you with us this morning.

TESTIMONY OF HON. BROCK ADAMS, U.S. SENATOR FROM THE STATE OF WASHINGTON

Senator ADAMS. Thank you, Mr. Chairman. It is a great pleasure to be here.

I would like to ask unanimous consent that my entire statement might appear in the record,[1] and I would like to summarize it because I know you have many witnesses this morning.

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[1] See p. 37.

Chairman GLENN. Your entire statement will be included in the record.

Senator ADAMS. Thank you, Mr. Chairman.

Mr. Chairman, I appreciate the opportunity to testify before these hearings on DOE's nuclear production facilities and the costs of cleaning them up.

I will be brief, but, Mr. Chairman, I want to start at the appropriate place, which is commending you for your leadership in this effort. This has been a long and lonely fight for you. We are with you. It has been a pleasure to cosponsor the S. 1085 with you.

I agree with you that it does not go far enough. But you worked so many years on this that I think that everyone should know that you have carried it alone and that the forces are gathering to help you.

You finally received the written cost estimate, Mr. Chairman. Those of us who represent these host States—and, yes, we have Hanford reservation in the State of Washington, and it will be one of the major problems to be addressed in the cleanup. We are in your debt, Mr. Chairman, for forcing the DOE, in effect, to reveal the enormity of this problem. The costs of cleanup, as you so well stated in your opening statement, are just staggering. The $110 billion is something that has not been addressed by anyone to this point. This will be a starting point for doing it.

Mr. Chairman, almost half of that cost is attributable to the Hanford reservation. We know this report is incomplete, and I am so pleased that you have the GAO also working on this so that we get definite figures, because the costs may be much higher.

For example, Mr. Chairman, the cost of much of high level waste program at Hanford is not included in the DOE estimate. I hope that will be developed in the hearings. As reported in DOE's environmental impact and statement on disposal of Hanford waste, high level, transuranic and tank wastes, which was released last December, these additional costs may run as high as $18 billion.

I might say parenthetically, it is in my statement, Mr. Chairman, but you are absolutely correct when you say that we do not have the technology even in some cases to know what to do with these. We have 149 single shell tanks into which high level waste was poured during all these years of production; many are leaking. We do not know how much they have leaked. We are not certain of the technology or whether they should be dug up. We do not know whether to touch them, whether to bury them.

Mr. Chairman, last night I offered an amendment, and I hope the Committee will pursue this, and I am looking forward to working with you on it, to create a laboratory facility with both EPA and DOE in it to do such basic things as how do you handle radioactive waste and what do you do with it? Is there some use that we can make of portions of it? I will address that in a minute on a bill that I have introduced with Representative Bonker to try to attack the problem of really disposing of waste.

Mr. Chairman, this laboratory will spread to other areas where we are involved with highly dangerous waste.

This $110 billion to clean up the Federal Government's nuclear facilities is just, as we know, not an isolated problem. Mr. Chairman, you have facilities, as we all know, in your State. Colorado

and many others are host DOE States. And I agree with your comment. We needed these nuclear facilities. We built them. They were secret. We haven't paid any attention to them. But it is evident to me, Mr. Chairman, that self-regulation of the Federal Government's nuclear weapons and materials production has left us with a terrible legacy in terms of environmental contamination and financial obligation. It is also, as you stated, and I agree, left the Nation with an unsafe, outmoded and decrepit defense production complex. Congress has taken some additional steps toward straightening out the mess, especially the independent safety board which you have in S. 1085. I am very pleased that has happened. I agree with you and I was pleased to cosponsor it, and I will stand with you to try to strengthen it as we go along.

My most important purpose in being here, Mr. Chairman, is to refer to the legislation that I have introduced as a potential means of starting to pay for this. As a former Secretary of Transportation, I am familiar with the use of trust funds for long-term construction projects where you have a regular amount of money going in. The appropriation of money, when you have a long-term project like a cleanup project, is very difficult to obtain on an annual appropriation basis.

We have introduced S. 2189, the Federal Nuclear Facilities Environmental Restoration and Management Act, that is aimed at putting in place a comprehensive program for dealing with the costs, regulatory and research needs that we all know will be necessary in this massive cleanup. S. 2189 was introduced in the House by my colleague from the State of Washington, Representative Don Bonker. It attempts to address the cost issue by creating a trust fund which would consist of appropriated funds, transfers from the other DOE nuclear and defense accounts, because I think we are going to have to have an item in there, Mr. Chairman, from year to year that is referenced to the cost of producing nuclear weapons so that we don't poison our people. Any fines or penalties collected would go into it. And there is an internalization of the costs of cleanup assigned to all of the users of DOE nuclear facilities.

In addition, the bill calls for a legally enforceable set of compliance agreements, the creation of an office of special counsel at the U.S. Environmental Protection Agency to enforce the Federal environmental laws at all Federal facilities, and requires coordination, Mr. Chairman—and this is something that this Committee I know has been working on, it is part of the basic jurisdiction of the Committee—the coordination of DOE and EPA environmental R&D programs to develop an efficient new environmental cleanup technology for use at the DOE facilities.

I have offered this legislation which was referred to Environment and Public Works as a starting point, Mr. Chairman, for the congressional debate on how we address the problem of cleanup and compliance at DOE facilities.

Mr. Chairman, I look forward to working with you and members of this Committee on a long-overdue task. Thankfully, your leadership has given us enough information and a base on which to build. I want to thank you for my people and my State and for the rest of the people in the United States. I thank you for the opportunity to testify.

Chairman GLENN. Thank you very much, Senator Adams. We look forward to working with you on this. I appreciate your being here this morning.

Senator ADAMS. Thank you, Mr. Chairman.

Chairman GLENN. Thank you very much.

Our next witness this morning is Mr. J. Dexter Peach, who is no stranger to this Committee. He has been here a number of times before. He is Assistnat Comptroller General for the Resources, Community, and Economic Development programs of the U.S. General Accounting Office. He is accompanied by Keith O. Fultz, Senior Associate Director, and William F. Fenzel, Evaluator, of the same division at GAO. Gentlemen, we welcome you this morning. Mr. Peach, we appreciate your being with us this morning.

I would make one further announcement here before we proceed. We will have to break whenever we are in the hearings at 11:30. We have a Democratic Caucus commitment this morning that has been on for some time. We went ahead and scheduled our hearings, knowing we would have about 2 hours for the hearing. I think we can complete our work in that length of time this morning. We would welcome any of the testimony that can be summarized. But, in any event, the total statements will be included in the Committee record.

Mr. Peach, proceed. Thank you for being here.

TESTIMONY OF J. DEXTER PEACH, ASSISTANT COMPTROLLER GENERAL, RESOURCES, COMMUNITY, AND ECONOMIC DEVELOPMENT PROGRAMS, U.S. GENERAL ACCOUNTING OFFICE,[1] ACCOMPANIED BY KEITH O. FULTZ, SENIOR ASSOCIATE DIRECTOR, AND WILLIAM F. FENZEL, EVALUATOR

Mr. PEACH. Thank you, Mr. Chairman.

As you know, we have issued over 30 reports, many to you and this Committee——

Chairman GLENN. Let me stop you right there. I want to point that one out.

I hope everybody heard what he said.

You have done 30 reports in this area over the past few years. I know we have had discussions on the floor of the Senate concerning this issue. I had 25 reports stacked up like this on the floor of the Senate. This is not something that is a come-lately type of thing. It is something you have been working on for a long time. And GAO has done 30 reports on this very subject.

I just wanted to underscore that one for you starting out. Go ahead.

Mr. PEACH. And I want you to know that we do appreciate your continuing emphasis on this area, because we do feel that it is an important problem that deserves and needs attention as we move into the 1990s.

Our two most recent reports: one focuses on enormous cost in dealing with the problem areas within DOE's complex, and the other deals with a continuing theme of our work, and that is strengthening oversight at DOE facilities.[2]

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[1] See p. 39 for Mr. Peach's prepared statement.

[2] See pp. 69 and 93.

The three major problem areas are upgrading existing capability to meet nuclear defense needs and to ensure the capabilities are operated in a safe and environmentally acceptable manner; environmental restoration to clean up existing contamination at DOE installations; and safely disposing of radioactive wastes and decontaminating nuclear facilities.

Our analysis of DOE's preliminary data indicated it would cost anywhere from $100 billion to over $130 billion to address problems in the DOE complex. These costs are in constant 1990 dollars. That includes about $20 billion to upgrade existing facilities, $35 to $65 billion for environmental restoration, and over $45 billion to dispose of radioactive wastes and to decontaminate facilities.

I would like to stress this information is not budget quality. It should only be used to illustrate the magnitude of the effort needed to address the problem. The overall figures that I am quoted do not include operational costs associated with producing nuclear material and weapons and ensuring compliance with existing standards. We have left that out.

Finally, it does not include expanded capability or relocation of existing facilities within the complex, something that is under consideration. According to DOE information, expanded capabilities and relocation could add another $15 to $25 billion to the overall cost of the nuclear complex.

Let me briefly discuss each of these major problem areas and also highlight so you understand the differences between our study and DOE's July 1, 1988 report entitled Environment, Safety, and Health Report for the Department of Energy Defense Complex.

First about upgrading existing capabilities, the key point is that these facilities are old. Much of it was built in the 1940s and 1950s and it is approaching the end of its useful life. Some have deteriorated to the point where they now have safety or operational problems. The current condition of some facilities in the complex has resulted in safety concerns that could lead to prolonged shutdowns, thus threatening the Nation's ability to produce nuclear weapons.

I think that is another point to emphasize. We are just not talking about safety and environmental problems that need to be cleaned up, but we are talking about a threat to be able to keep this complex operating to produce the material that is needed.

Now, in 1987, DOE assessed major facilities in the complex as part of a strategic planning effort. A key part of this assessment was to assign a fragility rating to the facilities. DOE used a scale of 1 to 5, where 3 meant the condition of a facility was average for industry, 4 meant the condition was marginal in need of constant attention, and 5 meant the condition was serious with no near-term solution. The rating system allowed the flexibility of rating a facility below industry average, between 3 and 4, and less than marginal, between 4 and 5. The ratings were done by officials at the facilities and not by an outside, independent group.

I would stress that again because one of the things that we have called for and you have strongly supported through the years is need for independent, outside oversight of these DOE facilities.

Even so, many facilities were rated below industry average, marginal, or less than marginal. The Savannah River Plant reactors in South Carolina were rated less than marginal. The marginal facili-

ties included a number of buildings at Rocky Flats in Colorado, the F-area separation facility at Savannah River, and some of the operations at the Feed Materials Production Center in Ohio.

Two other important facilities were rated below the industry average: the N-reactor in Washington, and the Idaho Chemical Processing Plant in Idaho.

DOE data on upgrading facilities indicated that about $20 billion is necessary to maintain the Nation's existing capability for producing nuclear weapons and to ensure that they are operated in a safe and environmentally acceptable manner. Those costs are preliminary. They are subject to change as more detailed plans are developed. One reason we believe that costs could increase as further assessments are conducted is because DOE has not clearly defined its nuclear facility safety policy including what commercial standards should be applied to DOE facilities.

They still do not have a formal program to systemically assess the extent to which their nuclear facilities meet commercial standards. Until such a policy is established and assessments made to determine the extent to which the policy is met, you really will not be in a position to identify all the necessary upgrades. Therefore it is quite likely that further costly upgrades will be necessary to ensure safe operation of the complex.

The second problem area involves environmental restoration. They face a massive cleanup effort at various locations. For over 30 years hazardous and radioactive wastes have been disposed of, in many cases, in a manner that allowed them to enter the environment. As a result, two interrelated problems exist at virtually all installations—groundwater contamination and inactive waste sites.

Groundwater is contaminated to various degrees with hazardous waste or radioactive material. At many installations the on-site groundwater contamination levels are hundreds or in some instances thousands of times above the drinking water standards. Further, at a few installations the groundwater contamination has moved off site or into rivers. Interrelated with this problem are inactive waste sites, one of the principal causes of such contamination.

The amount of cleanup costs is very uncertain at this time because the full extent of the problems may not be known and the extent of cleanup is uncertain. DOE does have preliminary data which indicate the cleanup cost could range from $35 billion to $65 billion. These figures are subject to change depending on the cleanup method chosen and the level of cleanup decided upon by DOE, the Environmental Protection Agency, and State governments. In any event, it may not be possible to totally clean up some installations; thus they may require long-term institutional care.

The third problem area, radioactive waste and decontaminating existing facilities. DOE has been temporarily storing high-level radioactive waste and transuranic waste for eventual disposal in geological repositories. It also routinely disposes of low-level radioactive waste. Finally, they must decontaminate their nuclear facilities at the end of their useful life.

They have plans for solidifying high-level radioactive waste and encapsulating it for disposal in a geological repository. They estimate the cost for high-level waste disposal at about $20 billion over

the next 25 years. In the case of transuranic waste, they plan to use special facilities to prepare and package this waste for final disposal in the geological repository, the Waste Isolation Pilot Plant in New Mexico. For low-level waste, they plan to process and dispose of some of this waste using improved confinement techniques. DOE estimates the cost will be about $10 billion over the next 25 years to dispose of transuranic and low-level waste.

Finally, there are literally hundreds of buildings that require special cleanup at the end of their useful life to remove radioactive material that has contaminated the facilities. The estimate for decontaminating nuclear facilities could eventually be over $15 billion.

Now let's talk about the differences between our report and DOE's report they recently provided you, which estimated that it would cost from $66 to $110 billion for corrective action and compliance activities. There are three important differences between the reports.

First, our report includes a discussion on disposing of radioactive waste and decontaminating nuclear facilities, estimated to cost over $45 billion. DOE's report does not address this problem area.

Second, DOE's report provides cost on its base environmental, safety, and health program. This base program is the day-to-day activities to ensure compliance with environmental, safety, and health requirements and is estimated to cost $40 billion through the year 2045. We consider this basically a normal cost of doing business that would be necessary whether DOE had problems or not. They are not reflected in our report. the cost estimates in our report are to illustrate the magnitude of effort needed to address major problem areas over and above the day-to-day cost of making nuclear weapons.

The last major difference concerns upgrading DOE facilities. We included upgrades because of the operationl problem: deteriorating equipment as well as environmental, safety, and health upgrades. We believe this is appropriate because operational problems can result in shutdowns and thus affect this country's ability to make nuclear weapons. Further, in many cases, operational problems are closely linked to or can lead to environmental, safety, or health problems.

I have an attachment to our testimony which explains in detail the major differences between the GAO and the DOE reports.

Let me close, Mr. Chairman, by calling attention to key GAO recommendations resulting from the work done for this Committee that remain important today, namely, the need for outside independent oversight of DOE operations and a comprehensive strategy to address the problem areas of the nuclear defense complex.

Outside, indepedent oversight is needed to ensure that DOE's nuclear defense complex is safe and environmentally acceptable. Such an organization should play a key role in DOE's rebuilding and/or restructuring of the complex. The comprehensive strategy is necessary to clearly show how the major problems will be addressed. DOE's recent study along with its ongoing modernization study could provide the framework for the comprehensive strategy that we have recommended.

Finally, the cost estimates highlight the formidable task ahead in weighing the enormous cost of correcting problem areas in the complex against competing budget priorities in a deficit-conscious era. Fundamental questions as, "What should our nuclear capabilities be?," "How clean is clean?," "How safe is safe?" will have to be asked as DOE restructures, rebuilds, and cleans up the nuclear defense complex. The answer to these questions and the need to set priorities will prove difficult choices for the Congress and for current and future administrations.

Mr. Chairman, that concludes my statement. We would be pleased to respond to questions you may have.

Chairman GLENN. Thank you very much, Mr. Peach. We appreciate the work that you have done on this.

Let me just compare one instance before I start asking you some questions, just to give an idea of the costs involved. At Wright Patterson Air Force Base back in my home State of Ohio a short time ago, we had an americium spill in just one little building where some of this material was stored. In that particular case, it should not have been stored on the base, but it was anyway, and that is a separate subject that we have addressed in the past.

This americium spill was small, and very few people were involved with it. We went in and tried to clean it up. It cost roughly over $1 million just to clean up that one tiny little spill on one base.

I bring that up just to indicate that this is going to be a terribly expensive matter. You cannot just go in with a pick and shovel and shovel this stuff up and toss it out. You just cannot do it that way. It is very, very complex to handle. Even the cleanup will endanger a lot of people performing the cleanup unless it is done absolutely in the safest, safest possible manner. And that was just one tiny little spill, and it cost over $1 million on one base just to clean it up. So you can imagine the enormity of the problem if we are doing to address this on a national basis.

Mr. Peach, you have testified that at six locations of DOE facilities around the country in Washington, South Carolina, Ohio, Colorado, California, and Tennessee, on-site groundwater contamination levels are hundreds, even thousands, of times higher than the Federal drinking water standards. Is that correct?

Mr. PEACH. Yes, and that is true for both radioactive-type materials at some sites and hazardous materials other than just radioactive materials at other sites.

Chairman GLENN. You have testified that at Lawrence Livermore Lab in California, at Fernald and Mound in Ohio, and at Hanford in Washington, the contamination has spread off site and into rivers also. Is that correct?

Mr. PEACH. That is correct, Mr. Chairman.

Chairman GLENN. And that the extent of contamination at all the DOE sites may not even be known because of inadequate monitoring. Is that correct?

Mr. PEACH. Yes, that is correct. Some of the inactive waste sites do not have groundwater monitoring, and of course we don't know that we have identified them all.

Chairman GLENN. Are those monitors being put in now, or is there——

Mr. PEACH. In some cases, at some of those sites. They do have money in the budget now at Hanford for some inactive waste sites where they did not have groundwater monitoring to try to put in monitoring wells. But as they identify other inactive waste sites, I suspect they are going to run into that problem in other locations.

Chairman GLENN. You have testified that the cleanup costs are really uncertain now, because we do not know the full extent of the problems. They may not be known, and the level of needed cleanup is really uncertain at this time. So, I would presume that the figures you are giving us and the figures that DOE has given us you would consider to be minimal figures. Is that correct?

Mr. PEACH. Yes. I think the costs are uncertain, and most of the indicators of uncertainly I would see pointing the arrow upward in terms of increasing costs, not decreasing them.

Chairman GLENN. Where do you feel the major uncertainties are? What are the areas that we are really can get the least handle on?

Mr. PEACH. There are several. One is, we do not know that we have identified all the inactive waste sites. That is still under way. So, we do not know that we have identified all the sites or locations.

Once you have identified all those inactive waste sites, there is a great deal of uncertainty about the extent of cleanup going to be required. And that is——

Chairman GLENN. Before you——

Mr. PEACH [continuing]. Going to require input from EPA and from the States and others that will be involved in working on that as well as DOE.

Chairman GLENN. I have a question here that I was going to ask you later but I will right now. According to your report, I believe there are at least 1,400 inactive waste sites within the nuclear defense complex. Correct?

Mr. PEACH. That is right.

Chairman GLENN. It is 1,400.

Mr. PEACH. That is right.

Chairman GLENN. How do you think these sites compare in hazard to those on the EPA list that are scheduled for cleanup under Superfund? Are they more dangerous on the average, less dangerous, what?

Mr. PEACH. Let's put it this way: they are at least as dangerous as those sites. EPA has a scoring system. They are looking at their Superfund sites, with a site being put on its national priority list for Superfund if it scores over 28.5, as EPA would score it.

Right now there is one DOE facility that is on that Superfund list, and that is the Lawrence Livermore Laboratory. But most of the other major facilities we are talking about have received preliminary scores from EPA. Those preliminary scores are such that I would say they would come close to ranking in the upper half of the kind of sites that are on the national priorty list. Certainly they are well within the mid points.

Chairman GLENN. Would all those 1,400 have radioactive waste, or are some of those just toxic waste?

Mr. PEACH. Most of those sites have radioactive and toxic wastes both.

Mr. FULTZ. They would be mostly mixed wastes.

Mr. PEACH. Yes.

In some cases you have got purely radioactive, you have got hazardous, but you also have mixed wastes that are hazardous wastes which have radioactive materials mixed in.

Chairman GLENN. And they are even harder to handle sometimes.

I did not ask Mr. Fultz or Mr. Fenzel if you had opening statement. Did you have any statements?

Mr. FULTZ. No.

Mr. FENZEL. No.

Chairman GLENN. Anytime you want to chime in here with Mr. Peach, please do.

Mr. PEACH. Just to give you some parameter on that. The sites that are on EPA's list range anywhere from 28.5, which is the bottom, the lowest number to get on the list, up to about 75. The types of preliminary scores for DOE sites have ranged well into the thirties, the forties and fifties and even some in the sixties. So, the level of contamination is serious.

Chairman GLENN. How much would costs increase if containment was mandated at the Savannah River reactor?

Mr. PEACH. My understanding, and I was at Savannah River in May and received a good tour of that facility——

Chairman GLENN. Just so everyone will understand, tell us what containment means and what would be involved with that.

Mr. PEACH. Well, it would basically involve a large concrete superstructure built over the reactor in order to try to contain in the case of an accident——

Chairman GLENN. Basically it is surrounding the existing buildings and facility——

Mr. PEACH. That's right.

Chairman GLENN [continuing]. With a reinforced containment vessel.

Mr. PEACH. That's right. They have a current system called confinement they use there, which includes a series of vents and filters so that if they did have an accident, material would be vented but it would go through filters before it is vented to the outside air.

The figure that I was given there was in the range of $1 billion per reactor. Now, you have got four reactors at that location, but you are talking about in the range of $1 billion a reactor, although there were issues and questions raised given the age and the condition of those reactors as to whether it would be cost effective at this point to try to do that. As you know, one of those reactors is shut down because of a cracking problem. They are looking at, can we repair those cracks? They have not found a repair method.

The others are operating at very reduced power levels because of deficiencies in their emergency core cooling system. Also they are currently undertaking seismic repair work on those reactors because of some identified seismic deficiencies.

Chairman GLENN. That buzzing in the back of the room there at the clock indicates I have to go. We are down to halfway through our voting period over on the floor. I have to go and vote.

I am sorry. We will have to stand in temporary recess. If any other Senator comes, we can go ahead.

[Recess taken.]

Chairman GLENN. The hearing will be in order.

Mr. Peach, GAO has been looking at this problem for some time now, as was indicated by some 30 reports that you indicated have been done by GAO over quite a number of years. So you have been looking at this problem for some time. I am aware that your view of the cost has evolved over a similar period of time if we are going to do this kind of cleanup. Can you tell us just a little bit about the history of GAO's estimates of cost and its view of the seriousness of the problem?

Mr. PEACH. Yes, Mr. Chairman. You know, we are known as being a pretty conservative cautious group down at the General Accounting Office. In March of 1987 in testimony before this Committee we for the first time really tried to lay out the size of the problem we are facing here and the need for a national strategy. At that time we talked about it was going to cost billions of dollars, and we thought it could be higher. By October 1987 when we were testifying, we were at the point of saying it was going to cost tens of billions of dollars. And we thought it could get close to $100 billion, and now today we are willing to talk about $100 billion in cost ranging up to possibly $155 billion at the high end of the estimates that we have.

Again, most of the indicators of things that could cause changes in these cost estimates we believe point upward, not downward. So, we are talking about the term staggering, the term enormous has been used; I think in this case those are appropriate terms.

Chairman GLENN. Your report notes that DOE's assessment and ratings of the condition of its major facilities were done by officials at the facilities, not by any outside evaluation, not by an assessor, who would, in effect, come in from outside and look at things. Would you expect that the managers at those facilities would be more likely or less likely to rate their facilities' conditions as poor or serious? I gather a lot of your own figures were based on their estimates, too. You assume that they did not overstate the problem?

Mr. PEACH. No. Since they have responsibility for operating the facilities day to day, to some degree you would think they would want to put them in the best light that they could. And when you consider that people at the facilities rating them as less than marginal, as marginal, as below industry average, on the one hand, and then you make some comparisons with other assessments you get a different picture. For example, the N reactor was rated as below industry average at Hanford, yet when the Roddis commission, an outside group, looked at the N reactor, two of its members said it should be shut down immediately because of safety problems. And then you go down and you look at Savannah River, the reactors there, where you again are rating them less than marginal, and we know that most of them are operating at reduced power because of problems with the emergency core cooling system and other issues.

One of the things I think this underlines is that I think at least some of these problems would have been dealt with earlier if you had independent oversight at DOE. And I think even with what

they are trying to do independent oversight is necessary and will be a help to them in getting this job done adequately.

Chairman GLENN. That has been my view all the way along. In fact, if I were head of DOE—and I am not volunteering to be head of DOE, but if I were, I would want such a group. I would want it to protect my own people and to make things as safe as could be. I would want the advice of an outside group.

In the original version of my bill, if the advisory group felt things were really tight safety-wise, were really important safety-wise, their recommendations should be made without regard to the budgetary import. In response, the Secretary could go ahead or disagree with the Board's version of things. If the Secretary did not have the money to clean up whatever the item was that they were talking about, then, it would automatically get bucked to the President for decision; because only the President has the whole picture of what our nuclear needs are, what negotiations are going on, the whole business of what the need is. Now, that is what they fought tooth and nail over there, and that is not in the final version right now, not quite like that. We have the board, but it does not quite have the authority to require a resolution of safety versus budget issues in all instances. It was weakened somewhat, but we will address that again at a later time. Personally, I think that it is necessary to resolve such issues once and for all.

Do your cost estimates include the cost of correcting all the deficiencies in all kinds of environmental monitoring at these facilities? Or did you just deal with the nuclear and the radiation problem and the mixed wastes, and so on?

Mr. PEACH. When you talk environmental monitoring issues, you know, there are cost estimates in there that deal with cleaning up the waste areas. When you talk about the monitoring problems and whether they are doing an adequate job of monitoring, there were two different kinds of problems.

One was not necessarily costly. That is the need for good quality control problems and good attention to detail as you are doing environmental monitoring so your records are kept properly.

The other relates to whether or not you have got monitoring wells in place for many of these locations and so that you will be able to monitor and get information. As I indicated earlier, at Hanford they do have money in the budget now to drill monitoring wells they need for some of the inactive waste sites. I think as they continue to identify inactive wastes sites they will find others that do not have monitoring wells and there will be more expense needed for that.

Chairman GLENN. Do you feel we have identified all the deficiencies yet, or is this just the beginning?

Mr. PEACH. No, we are not sure all the sites have been identified. They are still working on that and trying to complete their environmental surveys and locations.

Chairman GLENN. The enormity of this thing just sort of overwhelms you when you get into it and think about what has to be done as a result of this 30-year slide. While going back and forth to vote over here just a minute ago I was thinking that we had a good press turnout this morning. We have a full press table back here this morning. As a nation we became all excited about Love Canal

in upstate New York, and the toxic pollutants dropped there, and the need to clean it up. And Love Canal, compared to the enormity of this problem we have identified so far, is like a drop in the Pacific Ocean—a little more than that, maybe. I am not downplaying Love Canal. I am very concerned about all the people there and in other places where toxic chemicals are dumped. I was concerned at the time that that thing came out that we not see it repeated in other parts of the country. But, compared to the size of the problems we are talking about here, I wish we could just get the press and people of this country excited enough that we start doing something about this DOE problem.

Love Canal was a human tragedy—people left their homes, their children were affected, and things like that. That same thing is going on a thousand, a hundred thousand times all over the country today, and we are not doing a blooming thing about it.

If I wanted to challenge the press this morning while most of you are still here at the table, for heaven's sake, this is serious stuff. This is such a magnitude of level above anything at Love Canal that I just wish we could continue to get the press excited enough to do something about it, so we could see that reflected eventually in budget to do this cleanup. We are just playing Russian roulette with this whole system as far as health and safety goes until we do something about it.

Mr. PEACH. Mr. Chairman, we were talking at the recess here about the idea of Superfund when it was reauthorized, provided $8 billion. Now, many people feel that probably was not adequate to deal with the problems there, but still $8 billion was provided there. And the estimates we are talking about here are $35 to $65 billion.

Chairman GLENN. Let's at least start. I don't care what it is. Let's start. For 3 years, this is what we have badgered DOE for before we got an agreement to go ahead and get the estimates they have made. Let's at least put something in the budget to get started on this. This has been a long-lasting problem.

I obviously feel very strongly about it.

You mentioned some of these facilities maybe cannot be cleaned up and may require institutional care. Did you estimate any of the costs for institutional care? By this, we mean that some of the plants, some of these areas, would just be shut down, put on standby status, fenced in and that's it? I gather that is what you are talking about by institutional care?

Mr. PEACH. Yes. We did not estimate what those costs would be, but you are really talking about saying it has got to be restricted access. It will need to be continued to be monitored. You may have remedial action based on that monitoring that is going to have to take place. And some places maybe it will be involving guards to make sure.

Chairman GLENN. Guards, fences, whatever.

Mr. PEACH. That is right.

Chairman GLENN. And that was not part of your estimate, right?

Mr. PEACH. That is right.

Chairman GLENN. And we have some 1,400 sites, which may require that kind of care.

Mr. PEACH. Either that or the larger reservation on which they are located.

Chairman GLENN. Yes.

To get a little more technical here, your report on oversight issues states that the Deputy Assistant Secretary for Safety, Health and Quality Assurance told you that DOE has not yet integrated its safety policy with its plans for modernization.

Now, how can DOE estimate modernization costs without knowing what the implications are going to be of its safety policy?

Mr. PEACH. Well, the point is only with imprecision can they make the estimate and that any cost estimate you have got in this area is preliminary. You know, if you talk about coming up with a safety policy and then saying you are going to apply that safety policy, which includes such things as looking at issues of application of commercial standards, possible licensability questions of a new production reactor, all those things are things that we think could drive costs up. It is likely to make them higher.

Chairman GLENN. Your report states that you do not feel the figures are budget quality. You would not be willing to go on a budget with these things and back them up and say, here's absolutely what we need and these are the programs we have to have, and so on. And I know we are not at that stage yet.

What is required to move this to budget quality data? I guess my question would be: what do we have that is available to move to budget quality data so we can push somebody to put this in next year's budget, that is being drawn up now. We have not been able to get any substantial figure in there for cleanup so far like this. What do we have that is budget quality so we can push for that next year?

Mr. PEACH. I think it is going to be a while before you get the budget quality data. In other words, I think you have got to define the scope of the problem, decide where your priorities are and what you want to do, for some of the facilities where you are talking about upgrades or modernization. There is some budget quality data with respect to dealing with some of those facilities at Rocky Flats. They have tried to put some money in the budget to deal with where they have specific safety problems. But on the environmental area there is going to be uncertainty for a period of time here.

Chairman GLENN. Knowing the problem as you do, if you were putting together a budget for next year, would you be willing to ask for $5, $10, $15, $20 billion just to get started on this? We have been talking about it now for about 5 years.

Mr. FULTZ. If I could add to what Mr. Peach said.

Chairman GLENN. Yes.

Mr. FULTZ. We firmly believe that the minimum figure, as you stated earlier, $100 billion is a very safe figure to use as a starting point.

Chairman GLENN. Over what period of time?

Mr. FULTZ. Over 20, 25, 30 years.

Chairman GLENN. Okay, what will we start out with then? What should we be pushing for in next year's budget?

Mr. FULTZ. Well certainly right now DOE is not spending enough. The environmental health and safety budget of DOE pres-

ently is about $1 billion. Certainly that should be increased significantly. I hate to hazard a guess, but I would certainly say around a $5 to $8 billion increase would be a good start. But even then, given the enormous figure of $100 billion plus, even if you spend $10 billion a year, it is going to take 10 years.

Chairman GLENN. So, at least $5 to $8 billion dollars would get us started on the planning and help us get going on some of the things we know need to be done right now.

Mr. FULTZ. I think that is very important because, as Mr. Peach has mentioned, we do not really know the true extent of the problem. The environmental monitoring that has been done has not been adequate. It has not been accurate. We are just beginning to identify the size and the extent of the problem.

Mr. PEACH. I would say one of the things that will probably come out as you talk with DOE, their total budget in this area for the complex is about $8 billion. About $1 billion of the $8 billion is going to the environmental, safety and health area, including the normal kind of things they have to do to some degree. Now, you are talking about one area of their budget, the environmental safety and health area, that they did increase this year. It went from about $740 million up to a billion dollars. For most of the rest of the complex, DOE's budget stayed at about the same level. So, it is the one area they did seek an increase.

Chairman GLENN. Is DOE using state-of-the-art inspection methods now, as far as you know? I know they were not using state-of-the-art inspection methods, or so it was charged, to determine if cracks existed in the Savannah River reactor vessels. DOE responded by telling me that they plan to begin ultrasonic testing in 1988. Have they begun that yet?

Mr. PEACH. I will let Mr. Fultz take that.

Mr. FULTZ. No, sir, they have not begun to use the ultrasonic testing at its Savannah River reactors. We understood that they were supposed to do this sometime in 1988. As we mentioned, we visited Savannah River sometime in May of this year and were told then that that had been delayed to sometime in 1989. So, they have delayed doing this testing.

Chairman GLENN. What was the reason? Was any reason given?

Mr. FULTZ. Basically because of scheduling problems, some technical difficulties in developing the equipment. But I would like to stress that, given the period of time needed to produce a new production reactor, which current estimates range as long as 10 years, if those Savannah River reactors were found to have cracks, they would have to be shut down, then we could be without a production for a long time.

Chairman GLENN. Because of safety concerns, they are operating at 50 percent capacity right now. Is that correct?

Mr. FULTZ. That is correct.

Chairman GLENN. They were downgraded.

And we figure, according to one estimate, that they operated beyond their core cooling capacity in an emergency situation for some 7 years before we found that out and the levels were pulled back. I believe it was first to 75 percent. Then, a new estimate felt that to be safe, we had to bring it back to 50 percent. Was that correct?

Mr. FULTZ. Yes. They did reduce power three times at the Savannah River reactors in the last 18 months. The effect of those three changes today is such that the reactors are operating at about half their capacity, or as to what they were operating prior to December of 1986.

Chairman GLENN. Mr. Peach, given your longstanding experience in reviewing DOE's nuclear defense complex, how do you assess their actions to date? Have they been adequate?

Mr. PEACH. No, I do not think they have been completely adequate. But I would want to give DOE credit and particularly under Secretary Herrington since he has come on board for paying attention to this problem area. Under his tenure was the first time that we have seen at least some serious attention paid to environmental, safety and health, particularly in bringing in Assistant Secretary for that position even though it is not legislatively established, and we think it should be.

I think, looking ahead, the independent oversight is also something that we hope your bill will remedy as it goes through. We think that is needed.

We think, too, that DOE is going to continue to have problems in terms of looking at trying to maintain a balance between environment, safety, health and production. That is always going to be a tradeoff DOE must deal with. One of the reasons you want independent oversight in there is to help you make that tradeoff in a proper manner. I think congressional oversight has been important to that, and it probably will continue to be needed.

Chairman GLENN. I will turn this over to Senator Roth. I know he has some questions on this. But, let me just repeat what I said before. We accomplish things in this country not just by legislative action or by somebody picking this up on Capitol Hill. We get a national concern about it through the press, through the media. But, let me just say that I just hope you could address this issue. Love Canal, as I said before, was on the front pages of the papers for months and indeed years. There were separate articles and it was compared with the rest of the country. And obviously the size of this problem dwarfs Love Canal—and I am not downplaying Love Canal. I am concerned about all those fine people, too, and other places around the country that may face similar situations. But, this makes anything else I have seen pale by comparison. But, for some reason, when you put nuclear on the front of something, eyes glaze over. Nobody wants to write about it, talk about it, do articles about it, do TV documentaries about it. And yet it is an enormous problem of safety and health.

I just wish we could get the same national attention focused on this that we do on some of the other problems we have, so we could see that reflected in budget in whatever administration is in office.

Senator Roth?

Senator ROTH. Thank you, Mr. Chairman.

Again I want to congratulate you for your leadership in this area. I think the matter of safety at these plants probably would not have been explored so thoroughly if you had not taken such a strong stand down through the years.

What worries me is, are we going to do nothing about it until we have an accident or crisis? And then of course everybody will look back and ask why we did not take action.

Mr. Peach, part of the problem appears that the costs appear to be so huge that nobody really wants to tackle it. How accurate are these costs?

What worries me, could we be possibly preventing action from being taken by making the problem look so monumental?

Mr. PEACH. Well, I would look at it from a standpoint of a budget exercise to some degree. You need to understand the size and the scope of the problem, and you need to have an idea of the time-frames over which you want to address the problem, and you need to understand what your priorities are. The costs are sizable and therefore you need to move out in sort of a planned and priority-setting kind of an approach. I would think that would help you bring the cost in some kind of balance. But I don't think the kind of costs that we are talking about are overstating the problem.

Senator ROTH. Are there any steps or measures that could be taken now that would help reduce the long-term costs? In other words, by failure to take action now, are we only enhancing the costs in the future? If we begin a program now, will that have a favorable effect?

Mr. PEACH. Some of the kinds of things which DOE is looking at doing now we think will help in terms of presenting future problems. One of the things they do have to commit themselves to is operating their facilities, for example, in compliance with the Resources Recovery and Conservation Act on hazardous waste so that they do not create additional inactive waste site problems to deal with later.

Then also they are looking at just exactly what kind of safety standards to be applied and the extent to which commercial safety standards should be applied, particularly if they build new facilities, or they add on facilities. This would be very important for a new production reactor. But when you look at the past sins, the past neglect of dealing with environmental problems and the way facilities were constructed earlier and decommissioning and decontaminating those facilities, then you have got to deal with them as problem areas. And the costs are going to be substantial.

Senator ROTH. Are there broad differences among experts as to what needs to be done? Are the specialists in these areas, the nuclear matters, pretty much agreed as to what action is necessary?

Mr. PEACH. I think there are always differences in this area, but I think the differences are narrowing.

In other words, DOE, for example, has been open in saying they consider this now a major problem and it is going to be a substantial cost area to deal with. We can differ on what is included and what the costs are, but everybody is talking about this is a big problem. Much more careful attention needs to be paid to it. And much more careful attention needs to be paid to how we do business in the future to not create further problems on top of the ones we already have.

Senator ROTH. I believe the General Accounting Office has conducted more than 30 studies and reports in this area. Are your recommendations based on visitation, actual site visitation?

Mr. PEACH. Yes, sir, they are. We have, of course, as you know, regional offices around the country, so we are able to have staff go to these locations. We have people on site on Hanford. We have people on site at Savannah River. We have people visiting other locations. I and Mr. Fultz and other members of my staff have personally visited Hanford, Savannah River, Los Alamos, a variety of these locations.

Senator ROTH. So your work is pretty independent.

Mr. PEACH. Yes, it is.

Senator ROTH. Thank you, Mr. Chairman.

Chairman GLENN. Thank you, Senator Roth.

We do have to move along. As I said, we are going to have to end the hearing at 11:30 a.m., because of other commitments that were long established here. We appreciate that very, very much.

We appreciate your long-term interest in working with the Committee on this particular issue. You truly have the expertise here to look into this through your long-term experience. We appreciate your testimony very much, all of you. Thank you very much.

Mr. PEACH. Thank you, Mr. Chairman.

Chairman GLENN. Our next witness this morning is Mr. Joseph F. Salgado, Acting Deputy Secretary, U.S. Department of Energy. Mr. Salgado, welcome this morning.

As I indicated earlier, before you arrived, we have a commitment this morning of our Caucus, which all members have to attend, so we do have to end the hearing at 11:30 a.m. this morning. If the statement can be summarized, fine. If not, the whole statement will be given. In either event, the entire statement will be included in the record.

We appreciate your being here this morning, and would you identify the other gentlemen with you this morning please?

TESTIMONY OF J.F. SALGADO, ACTING DEPUTY SECRETARY, U.S. DEPARTMENT OF ENERGY, ACCOMPANIED BY TROY E. WADE, ACTING ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, RAYMOND P. BERUBE, DEPUTY ASSISTANT SECRETARY FOR ENVIRONMENT, AND RICHARD W. STAROSTECKI, DEPUTY ASSISTANT SECRETARY FOR SAFETY, HEALTH AND QUALITY ASSURANCE

Mr. SALGADO. Mr. Chairman, I thank you.

To my right is Mr. Troy Wade, the Acting Assistant Secretary for Defense Programs. To my left is Mr. Ray Berube, Deputy Assistant Secretary for Environment. To my far left, sir, is Mr. Rich Starostecki, the Deputy Assistant Secretary for Safety, Health and Quality Assurance.

Chairman GLENN. Thank you. Proceed please.

Mr. SALGADO. Mr. Chairman, I would appreciate having my formal statement submitted for the record,[1] and I will try to be brief in my opening statement.

Over 3 years ago Secretary Herrington came to the Department of Energy. Although reasonable men can differ and reasonable persons can differ many times over, I firmly believe that we should

[1] See p. 50.

not differ over the fact that, in these 3½ years, we have been committed to improving the workings of the Department and its safety and its environmental processes. We have accepted the responsibility of the missions and goals of the Department, and we also accepted with that responsibility, a parallel responsibility to operate our facilities in a safe, efficient manner and in an environmentally sound manner.

The record speaks for itself. The Secretary created an Assistant Secretary for Environment, Safety and Health and consolidated those functions with one position. If you look at the budget, between 1985 and 1988, you will see that the budget for ES&H increased 80 percent. Needless to say, that was during the time of Gramm-Rudman budget deficits and budget constraint. The staffing within that organization increased 62 percent.

We have moved forward and tried to move forward aggressively to address some of these problems. It may be perceived as slow in some cricles, and it may be perceived as not enough in others. But we have been committed to move forward.

Approximately a year ago I came before you, sir, and you requested that we provide you a report dealing with the need for environmental cleanup and restoration and safety within our defense facilities. Predating that meeting and predating the report that we submitted to you on July 1, 1988, the Secretary in, I beleive, 1986, had made a commitment to the tune of $60 million, that we in the Department should go forward with an environmental survey. That was the genesis of a question asked to Mary Walker and Ray Berube: what are our environmental problems, what are the Department's evnironmental problems? And the answer, sir, regretfully was: we don't know. In 1986 we did not know. We did not have a baseline indication or indices of what the environmental problems were in the Department.

We committed ourselves to go forward to identify the environmental problems, identify the environmental risks and those areas of potential risk, and then eventually to prioritize those, so the Department, the executive branch and the legislative branch could take a long-term corporate approach to solving these very complex problems, stemming from a 10 to 20 to 30 year legacy.

I would now like to focus very briefly if I could, sir, on the environmental restoration.

We in the Department realize and recognize our responsibility to correct the legacy of environmental contamination problems that do currently exist in our facilities. We recognize that our progress to date may be viewed as slow. However, I cannot stress enough that we must understand that the scope and technical complexity of these problems and the costs do preclude quick solutions. On the contrary, most of the problems that we are facing require time-consuming detailed studies to fully define the nature and extent of the problems and to design solutions that will be effective and that will last.

In addition, because the legacy is so large, we must have the means to establish priorities to ensure that the most serious problems are the ones that are corrected first. We have attempted to do that and we know of your concerns in this area.

I will forgo any further comments for the sake of brevity because I do believe that the dialogue between you, members of your Committee, and ourselves is much more important than any further comments.

I would ask that the full statement be submitted. I would welcome your questions, sir.

Chairman GLENN. Good. Thank you very much. That was brief, and I appreciate that so we can get to discussion of this.

Do any of the rest of your colleagues have any comments they wish to make before we start?

Mr. SALGADO. They do not, sir.

Chairman GLENN. All right. Thank you.

Gentlemen, I invite you to speak up, if you want to, no matter what he says. [Laughter.]

You don't know where you're employed tomorrow if you do, but that's the way it goes.

Now, the budget that will be submitted next January is in the formative stage now. Budgets are always worked a year or so ahead of time. So, I am sure that we have made some estimates on budget in this area. How much for cleanup and environmental concerns and cleaning up the whole system? You have made estimates in the order of $100 billion. It can be between that and $170 billion over a 20-year time period. But, GAO testified a few minutes ago they thought it was reasonable to have somewhere from $5 to $8 billion perhaps in the budget for next year, to at least get started on this.

Let me say this. I am very complimentary to you and to Secretary Herrington for getting started on this. But I am not so complimentary to this administration or the previous administration. This is not a political matter as far as I am concerned. During this administration or the previous administration, the fact that we come up to 1986 and, as you say, we did not know what the problems were. That is 6 years into this administration, plus whatever time in the previous administration we were pointing out some of these deficiencies. And here we were in 1986 after years and years of pointing out this problem, we did not even have estimates on it.

So, you are right. You have a legacy of problems, as you put it, and I agree with that. They are a legacy. They did not all happen on your watch. They have happened over the last 35 years of ignoring some of these problems. It is going to be expensive. To bring it down to practical terms, what is the Department of Energy going to ask for in the budget that President Reagan will submit next January to get started on the cleanup?

Mr. SALGADO. I cannot indicate to you, sir, because the budget—I do not know what President Reagan will submit next year. As a matter of act, I do not know what the Department will submit either from the program level to me at my level because we have not gone through our internal process by which the programs come forward.

I would invite Mr. Wade and Mr. Berube to comment if they so desire if they have any preliminary numbers. I would caveat that it has not gone through our own internal budget review process within the Department, and final determinations have not been made.

Chairman GLENN. Nor the fine mesh at OMB either.

Mr. SALGADO. Obviously, sir, the administration budget will not be even submitted to OMB for probably another 35 to 40 days.

Chairman GLENN. Well, okay, good. Maybe we can take this up in a couple of months then, this fall or something like that. I am well aware that an outgoing administration does not want to leave a budget deficit any larger than they need to. Something like this that has hung on for 30 or 35 years and is easy to put off to the next administration, be it Bush, Dukakis, or whomever, is an easy path to take. No one wants to put in an additional $5 to $8 billion in there.

But, I would hope that, in the interest of national responsibility, they would do that. So I hope you use every effort you can. If you want to quote me here as giving Senate support, I can guarantee you I will do everything possible to support such a budget figure, or more, as far as that goes, because I think we have to get on with this.

Can either of you gentleman give me an estimated figure of what you are going to ask for?

Mr. Wade?

Mr. WADE. Senator, the defense program's budget formulation for fiscal year 1990, which we have not yet submitted to the Deputy Secretary, has $1.4 billion in it for environment, safety and health activities. Now, admittedly that is not enough to move forward aggressively on the long-range problems that we have.

One of the additional complications, as you know, sir, is that the defense program's funding comes out of the 050 account and is therefore subject to the provisions of the budget summit. But we have a lot of work to do with OMB and with the DOD on this very issue.

Chairman GLENN. Yes.

Mr. Berube, can you give us any? That's not a very definitive budget figure for me. That was not what I was looking for. Can you give me any better estimate than that?

Mr. BERUBE. Well, defense programs, Mr. Chairman, does have the responsibility for formulating the budget. Now, with respect to environmental cleanup, funding levels have been increasing. Fiscal year 1988 for defense programs again had a budget of roughly $100 million. Actually, the more accurate number was $97 million. That is being increased by Congress in fiscal year 1989 over the request of $120 million, to a conference committee report level of $160 million. That is just for environmental cleanup.

Chairman GLENN. When you are talking a $120 million increase, what we are talking about is doing some more studies with money like that. We are not talking about getting in and really doing substantial cleanup at Savannah River or Hanford or any place like that.

Mr. BERUBE. We have some real cleanup activity under way at some sites. But with respect to the whole DOE complex, essentially we are at the early phases of a very time-consuming cleanup process that does involve studies. We have completed the preliminary assessments for all of the inactive waste sites in the full DOE complex.

Chairman GLENN. Do we have the technology now to do the cleanup? Can we be voting money just to do the research, if that is going to be required? We do not know how to clean up some of these things, do we?

Mr. BERUBE. I agree with that statement. And, yes, we do have some technology development efforts under way. One, for example, is out at Pacific Northwest Labs in Washington, where we are studying in situ vitrification of radioactive waste. It has potential application to toxic waste and to mixed waste as well. In fact, that technology is being considered by EPA on some of its Superfund——

Chairman GLENN. Is that the electrode concept?

Mr. BERUBE. Yes, that is correct, sir.

And there are other technology development efforts under way. But I do agree that we have additional needs.

Chairman GLENN. Yes. I make a regular visit to Batelle out in my home State. It is in Columbus, where I happen to live. I have talked to them about some of those techniques a short time ago. I was very interested in them. I had not been aware of some of that. It looked like it had some promise for some of these intractable problems we have had and now we do in situ-type control of these things without having to go in with excavators or something that we do not even know how we would do at this point.

Some of the technology on watertable decontamination we do not know how to do yet.

Can we just get research money and get started? I have been trying for years to get somebody to say let's make a first step on addressing a long-term problem. We cannot even do that.

Mr. SALGADO Mr. Chairman, I would indicate that there is a proposal that is being considered within the Department for establishment of an environmental research and development center, at Hanford, and Batelle is the leading proponent right now. We are considering doing that because I think that in the long term it can be cost saving and effective to know how we can better and more efficiently clean up these problems rather than putting money into cleanup immediately and at the same time not knowing what we are doing.

Chairman GLENN. GAO says that sites at Hanford do not have groundwater monitoring systems; some chemical discharges at Los Alamos are unmonitored, certrain sludge residues at Pinellas are not tested for contamination, and improper sampling or analysis of data may be occurring—may be, I stress, to give you full credit here—may be occurring at Savannah River, Fernald, Y-12, and Los Alamos.

Those are things that we could get started on or just monitor and define better. When will those problems be fixed?

Mr. BERUBE. First, we generally agree with the assessment that GAO has provided. In fact, I think they base it on some of our own Environmental Survey work.

Chairman GLENN. They did, and they acknowlege your cooperation in this. I want to give you full credit. I am not here to browbeat DOE at all. They give you full credit for cooperating in their studies. I compliment you for doing that.

You knew, going in, that some of it was not going to be to your benefit necessarily, but you cooperated with them, and that is to your credit. I compliment you for that.

Go ahead.

Mr. BERUBE. With respect to Hanford and the inadequacies regarding groundwater monitoring wells, there are two different aspects of that. One related to our active hazardous waste management operations, in the most part was caused by 7 years of uncertainty regarding RCRA's applicability to DOE's Atomic Energy Act activities. It started in 1980. We ended it in 1987 with the May 1 rule. This subjected all of our radioactive waste that has hazardous waste to RCRA regulation as well as Atomic Energy Act.

We have ended the uncertainty. Now we are in a catch-up mode.

The way we see of getting the facilities into compliance is through these enforceable compliance agreements with EPA and the States. They are road maps for bringing the facilities back into compliance. But we are playing catch-up.

Now, with respect to inactive waste sites and the need for monitoring wells there, to further define the nature and the extent of those problems, yes, that is going to be a massive program by itself. We actually need to prioritize even that investigation work. Using EPA estimates, we are talking about roughly 10 percent of those total costs that we have reported—$37 to $65 billion—would be devoted to investigation work.

In connection with that, we will be drilling a whole lot of wells.

Chairman GLENN. But, do we think we can do all this monitoring and all the other things we are talking about here on $1.4 billion? Mr. Wade, you indicated that might be the figure that went in. I am sure that will get measured down by OMB. Can we do all the things on monitoring and the things we know how to do right now on $1.4 billion?

Mr. WADE. Certainly we cannot do it all, Senator. But included in that number are an additional 10 monitoring wells, for example, at the Hanford reservation. We drilled an additional 17 this year, and there are 10 more scheduled for next year.

Chairman GLENN. How about the chemical discharges at Los Alamos, the sludge residues at Pinellas, the sampling at Savannah River, Fernald, Los Alamos? When will these problems be fixed? Are they part of the $1.4 billion?

Mr. WADE. Yes, they are, and there are activities under way on all of those. They were not new problems to us. Again it may simply be a question of speed. But we are, for example, taking care of the problem at Los Alamos. We have a newly installed treatment unit to respond to that particular problem in Tech Area 16, so I think we are trying to deal in some fashion with everything the GAO identified.

Chairman GLENN. We have been talking in different parts of the country about compliance agreements: Different States have been pushing on these to get compliance agreements. But those compliance agreements are not worth the paper on which they are written or the signatures at the bottom unless there is funding to back up what is agreed to in the compliance agreements.

That is what I am talking about. We have some of those compliance agreements being worked out in Ohio right now at Fernald.

They do not mean a nickel's worth of anything unless we have the money to do something about it. And we have those agreements being worked out all over.

Do we know, with current compliance agreements, how much money is going to be required to comply with what we are agreeing to?

Mr. BERUBE. In the way of an example, at Rocky Flats, where we had the landmark agreement that we entered into in July of 1986, I believe under the first year of that agreement there was an awful lot of wastestream characterization work that was involved, again studies, but nevertheless very expensive and critically important. I believe the original cost estimate was $6 million to do that work. It ended up costing $13 millior I believe. DOE and Defense Programs and Rocky Flats found the money to do the work. We are living up to the commitments we have made in those agreements.

The same situation at Fernald and at Portsmouth and at Idaho——

Chairman GLENN. Okay, good in that——

Mr. BERUBE. But you are right, sir, in that when we finish the studies and have to do the cleanup work, the money has to be there.

Chairman GLENN. We cannot go along just doing this on pocket money.

We need to approach this on a nationwide basis. I know you agree with this. But, this cannot be just on compliance agreements and nice intentions. It has got to be done with budget backup, and that is what we have lacked. We have not gone in and fought for it.

I think the time has come with these reports now and with all the 30 reports that GAO has done, and your own concerns that I know are real. I do not question your intention in this at all. I never have. But, I do question the administration's willingness to go fight for the budget to back it up. We have not seen that. That is what I am concerned about.

If we are only going in for $1.4 billion and we are talking about this being a $100 to $170 billion program over the next 20 years, $1.4 billion is not going to cut it. That is not even going to get us a good start on the problem.

Mr. SALGADO. Mr. Chairman, I agree with you. I think that this is a national problem. It is a problem that is not solely of the executive branch or the legislative branch; there has to be a commitment of resources to go forward.

I agree with you wholeheartedly, because we can continue to come back, and the Department and the executive branch can come back year after year before this Committee, and all we are going to be able to do is lose ground. And the studies that we have invested time and effort in will be outdated, outmoded, and we will not be prepared to address the problem.

So we agree with you. We understand that this is a national problem. The question is, is it a national priority?

Chairman GLENN. I agree with you completely. I think that leadership must come from the White House. It surely does. Unless we get a President and people in the White House that are concerned about this problem that, as I said before, makes Love Canal and some of the other toxic waste things and some of the Superfund

problems look tiny by comparison; until we get somebody who is willing to fight it through OMB concerned about this, we are not going to make any progress on it. It is only going to get worse, and it is going to get more difficult to clean up in the end.

How many of the DOE nuclear facilities will have been deactivated and will await decontamination and decommission by, say, 1995? Do you have any figure on that?

Mr. SALGRADO. I believe Mr. Berube has got the figures.

Mr. BERUBE. If my memory serves me well, I believe the number is in the range of 400 facilities.

Chairman GLENN. I think that is correct. That is what GAO's testimony had, and I presume that they got those figures from you.

My second question, though is whether DOE has a plan indicating what techniques of decommission and decontamination will be followed? In other words, do we know what it is going to cost to dismantle these facilities, or to entomb them like Chernobyl, or to put them on an institutional standby status of some kind? Do we have estimates for that.

Mr. BERUBE. No, we do not.

We are working, as you well know, Mr. Salgado committed to expanding the recent July report to cover the whole DOE complex and to update information on the defense complex in December. In that report we will have better information, we will have information on D&D activities.

Mr. SALGADO. Mr. Chairman, it should also indicate for the record that the report that comes in December will also be accompanied by the defense modernization study that is currently under way. So there should be a convergence of several reports in December addressing not only modernization but also the completeness of the baseline survey activity.

Chairman GLENN. Do we, in this D&D process, this decontamination and decommissioning, do we know everything we need to know now about how to do that? Do we have the technology to do that?

Mr. SALGADO. I do not believe that we do. Mr. Wade, do you have any idea?

Mr. WADE. We certainly do not have it all, Mr. Chairman. We have the technology to do things like entombment and to deal with older reactor sites and processing facilities.

We do not have the technology to deal with some of the waste sites that Mr. Berube spoke about.

Chairman GLENN. Are you then asking for money to do the research necessary to find out how we will deal with this problem?

Mr. WADE. Part of the money in my fiscal year 1990 request will deal specifically with the problem at Hanford, the waste area at Hanford and the in situ experiments that we talked about earlier.

Chairman GLENN. To do the research to find out how we are going to do that?

Mr. WADE. Yes.

Chairman GLENN. How money is set aside for doing that kind of research?

Mr. WADE. I do not have the specific figure for that, Mr. Chairman. We will furnish it for the record.

Chairman GLENN. Good. I would appreciate it if you would. Thank you.

[The information referred to follows:]

The Office of Defense Waste and Transportation Management in Defense Programs has proposed in its FY 89 funding under Waste Research and Development about $62 million for all long-term technology research for HLW, TRU, LLW and hazardous chemicals. Defense Programs has also proposed funding under hazardous waste compliance technology demonstrations supporting compliance with regulation. Basic research necessary to support R&D and demonstration is provided by the Office of Energy Research for about $5 million in FY 89.

Mr. BERUBE. If I could just add, I do believe that there is also technology development work under way specifically in the D&D program. I do not have any details in terms of the amounts of money for that, though.

Chairman GLENN. GAO's testimony indicates that it will cost about $45 billion to deal with three essential elements of cleaning up DOE sites: $10 billion for dealing with transuranic waste, $20 billion for placing high-level radioactive waste in suitable repositories, and $15 billion for decontamination and decommissioning of facilities, which I would assume would be a very low figure.

Why were those figures left out of DOE's cleanup costs? They are obviously part of the whole problem.

Mr. SALGADO. Well, Mr. Chairman, I have asked that question myself since I saw your letter come in. Essentially what occurred is that the disposal of radioactive, high-level waste has been a programmatic, ongoing issue. Those numbers have been submitted in reports to the Hill on an ongoing basis. I believe our June 1987 report also indicated the number of $30 billion in that activity.

So, the effort that went forward after our meeting a year ago was to try to define those areas where we had unknowns involved. And there we are trying to put some parameters around the cost factor involved with those unknown factors.

The D&D activities, I believe, had been addressed in early programmatic areas at the same time.

So there are differentiations in numbers. The numbers that were not included in our report to you were included in previous reports, I believe, to this Committee and the Armed Services Committee.

Chairman GLENN. Well, you would agree, though, that those figures they gave are legitimate figures as part of the overall problem?

Mr. SALGADO. I believe most of GAO's figures are figures that they got from our other reports and they——

Chairman GLENN. They are, but these would have to be added then to your $110 billion figure. You would agree then that at least we are up to $155 billion at that point.

Mr. SALGADO. Yes, I don't believe there is a disagreement in the overall numbers.

Chairman GLENN. Okay.

Mr. SALGADO. In fact, the December report that is going to encompass all of this will basically include those numbers as a wrap-up to the entire——

Chairman GLENN. All right, so we are getting closer then between your figures and their figures as to what is needed. We are now up to $155 billion. The difference is now $155 to $170 billion between the two estimates, which is pretty much in the same ballpark.

Mr. SALGADO. I don't believe that when we finish our analysis, that there will be much distinction between the GAO numbers and ours. It's merely a question of definition of what was included. And some of our numbers that were not included are other programmatic areas.

Chairman GLENN. Well, these are areas that are going to have to be dealt with. $15 billion, it seems to me, for all the decontamination and decommissioning seems low; I don't know. Don't you think that is a low figure?

Mr. SALGADO. I think there is a lot of "guesstimate" and estimates going on in all of these figures, giving merely the time factors involved, and not knowing the complexity of the problem. And I would agree with you that it is probably a low figure.

Chairman GLENN. I indicated earlier, just to give an idea of the complexity of this thing, that we had a little problem building out at Wright Pat. You may remember that one, where there was an americium spill out there at Wright Patterson Air Force Base. By the time we got done with it, it was a fairly small matter. They opened the thing and got some of the stuff contaminated, the little building. By the time we got everything done in the building taken care of, and everything back under full, absolute safety, health concern control again, it had cost over $1 million, for one, tiny, little building. Just to indicate the nature of it, you cannot just go in, grab this stuff up, take a shovel and start loading it into a wheelbarrow or something. It just is not handled that way. So this indicates the complexity of it.

Mr. SALGADO. I think a review of the West Valley project that has been done by the Department of Energy will indicate also that there are major uncertainties and those uncertainies are always on the side of cost additions and not diminishments.

Chairman GLENN. Yes.

Well, did you know abot the extent of environmental problems at West Valley? I was going to get into that if we had time. Since you mentioned it, let's take West Valley right now. Have you defined all the problems up there?

Mr. SALGADO. I would ask Ray. Ray and, I believe, Troy both have been involved in that. It has been an ongoing project.

Chairman Glenn. West Valley was a reprocessing plant operated for only about, what, about 6 years, late 1960 or early 1970s, I believe, and whose cleanup is going to get up into the—we don't know what it is going to cost. It may be billions for that one site. Can you give us an estimate of what it is going to cost for West Valley?

Mr. SALGADO. I do not have an estimate. Troy?

Mr. WADE. I believe the estimate is about half a billion dollars, Senator. The original public law which started the West Valley demonstration project was $380 million, I think, and it has increased since that tme.

Chairman GLENN. As you see there is irreversible contamination and environmental damage at several of the DOE facilities, including Savanah River, Hanford, and others? Even if we go to these expenditures we are talking about, and do everything we know how to do on cleanup, is there any feeling that some of these sites will

never be returned to normal activity at all, that they will be there for monuments into the future as to their prior purpose?

Mr. SALGADO. I think in all candor, Mr. Chairman, I think the answer is yes. I do not think that we will be able to return these to their pristine state. I do not think we have enough knowledge of the complexity of the problems. I think you are probably correct in your statement, regrettably.

Chairman GLENN. Does the $15 billion figure that I mentioned before here, as the figure for decontamination and decommissioning, does that asume that we will not dismantle these radioactive facilities, but we will, in effect, entomb them or put them on some sort of permanent institutionalized basis?

Mr. BERUBE. The $15 billion is actually a GAO number, which I belive they express as greater than $15 billion. They derive that in part from estimates that DOE has developed, that go in the range of $5 to $7 billion for D&D of facilities either already inactive or expected to become inactive through 1995.

There will be, of course, additional facilities that will become inactive after that time period.

Chairman GLENN. But the question was, would the 15 billion include dismantling these facilities or just entombing them where they sit?

Mr. BERUBE. I don't know what GAO included in that when they came up with the——

Chairman GLENN. Well, what is your intention of how these facilities should be taken care of, regardless of what GAO said? Do you want to entomb them as is, or do you want to dismantle them and dispose of the material and the equipment?

Mr. WADE. I think in the final analysis, Mr. Chairman, it will be some of each. For example, the reactor sites at Hanford, it is not either necessary, I think, or cost effective to completely remove everything. I think entombment is being considered and planned for the old reactor sites at Handford.

There are other facilities where dismantlement is planned. That is the case for some of the facilities at West Valley, for example. Some will be dismantled. Some will be entombed, and some will be used as storage sort of in perpetuity.

Chairman GLENN. You have an EPA national priority list, I believe. In your July 1 report, you indicate that 9 defense complex sites have been identified as candidates for that NPL for EPA's national priority list. How many total sites, have been placed on that list? Just those nine, or will there be more?

Are there more now?

Mr. BERUBE. Currently we have one DOE defense complex site that is on the national priorities list. That is Lawrence Livermore. Rocky Flats has also been proposed for listing. And Hanford just very recently. We expect that the number in the defense production complex will be nine.

Now, those are the DOE major sites. GAO earlier talked about 1,400 inactive waste sites at the DOE defense complex. That does not equate to 1400 Superfund type sites or NPL sites. At Hanford, for example, there are over a thousand inactive waste areas, spill areas, leak areas. Hanford will be listed as four NPL sites, covering all of the inactive waste areas, spill areas, leak areas at Hanford.

Chairman GLENN. Of this $170, or $150 to $170 billion, whichever estimate we are dealing with here, I want to make certain we understand exactly what that would encompass. As I understand it, those are the figures that we are talking about just to make the things more safe from safety and health standards as we know them now, and to clean up existing dangerous situations. This would not be the total amount required to upgrade those plants, to replace those plants and make them safe, and to keep the same production capacity. I am trying to define this as production capacity as opposed to cleanup. As I understand the figures now, it would be $150 to $170 billion, just to take care of the cleanup and the existing situation without regard to production increases or maintenance. Is that correct? If not, spell it out for me.

Mr. SALGADO. It is not exactly correct.

Mr. BERUBE. If you start with the number we reported in the July report, $66 to $110 billion, now that covered dealing with ES&H requirements. And if you added it to that, the $35 to $45 billion of modernization, that's our estimate on modernization cost——

Chairman GLENN. Okay.

Mr. BERUBE [continuing]. Which would bring you, on the high end, to $155 billion, yes, it does include that.

Chairman GLENN. Okay, well, that is a little better. But the bulk of it still would be for safety and health matters——

Mr. BERUBE. That's right.

Chairman GLENN [continuing]. And for dealing with existing situations, whether we entombed or we dismantled, whatever.

Mr. WEISS. The GAO assumes that there would be an additonal amount of $15 to $25 billion for additional production capacity including the SIS facility in Idaho and a second new production reactor. I think that is what the Senator——

Mr. SALGADO. That is correct. The modernization study that will be completed in December will be addressing the complex in the year 2010, and there will be additional costs on top of these figures when that study is completed for additional capital equipment and modernization.

Chairman GLENN. I want to give Senator Sasser time to get his questions in here. I know his great concern. He has interest in his own State on this that he and I have discussed many times. He is extremely concerned about these matters of safety and health. He has Oak Ridge and all of that area and the complex there, which goes way back to the early days of the nuclear program in this country, of course.

Let me just say in wrap-up, I know that these hearings cannot help but be confrontational sometimes. But, I just want to work together with you and get a decent budget on this. I truly do.

I just think $1.4 billion to accomplish the thing that we are talking about, if that is the figure you are going to submit, I just think that is woefully inadequate to do more than just take a tiny little nibble at this huge, huge situation. I would hope that you would go several times over.

GAO, a little while ago, said $5 to $8 billion, somewhere in that neighborhood, would at least get us started. We have had an awful time getting started on this, as you are aware. And I do not put it

all on your backs. You have inherited a 35-year-old problem here. Our newest nuclear production facility, I would say to everyone in the room, is now 26 years old; our newest facility is 26 years old. So it is no wonder that we are having some problems in these areas.

We need that capacity. I have been the biggest supporter of having our production capacity kept up where it should be. We cannot let that down. We can use some of our stockpiles, some of the material that comes out of the INF warheads that are coming out, can be used for some of the material, and things like that. But, no one questions, I don't question, in fact, we still need the DOE complex, and it has to be very capable if we are to have it provide the deterrent factor that we know it provides. And I support that fully. But, from the time we did start getting on this quite a number of years ago, we were appalled at the lack of concern for safety that has developed, the safety and health and the decontamination and the—just as an example. Fernald. Through the years, we estimate now some 300,000 pounds of uranium dust were let out of Fernald that came down over the community—300,000 pounds of uranium dust.

Well, I will not go through all the steps that should have been done years ago. Let's take it here and now and try and do something about this.

I just guarantee you, whatever you will put in for in the budget, I will do everything I know how to support to get it so we get started on this thing at long last. It has been let go for too long. It has been let go for 30 years. It happens to fall on our watch to get started on the cleanup. That is what we want to do, and we want to work with you on it.

Senator Sasser?

OPENING STATEMENT OF SENATOR SASSER

Senator SASSER. Thank you very much, Mr. Chairman. And I want to commend you, Mr. Chairman, for conducting this hearing today on the cost of cleanup of Department of Energy facilities around the country. Also, I want to thank you, Mr. Chairman, for your persistence in pursuing this issue so diligently over the years.

I might say that I, too, have an abundant interest in this whole issue. The cleanup of these contaminated sites is a topic of great interest, as you indicated, in my home State of Tennessee because of the environmental contamination problem at the various facilities there in Oak Ridge.

The Chairman indicated that our newest facility, I think, is over a quarter of a century old. But the Oak Ridge installation is the oldest facility in the Nation and therefore has a longer history of poor disposal practices than many of the other Department of Energy defense production installations.

The environmental consequences of these poor disposal techniques have been felt for a long time in the Oak Ridge area. I believe that the residents of the Oak Ridge area in Tennessee have a remarkable history of patience and cooperation in the effort to clean up the area. But I think it is important to assure them that all appropriate measures are continuing and that the restoration process will be completed just as soon as practicably possible.

Now I am very concerned about the cost of repairing the environmental damage that has occurred in connection with the production of nuclear weapons. This is an unanticipated expense that certainly increases the cost that should be attributed to the production of these nuclear weapons. The figures suggested by the Department of Energy, the General Accounting Office are literally staggering: $65 billion, $110 billion, even $130 billion to clean up the existing pollution in just these few sites across the Nation.

To put it in perspective, this is over one-third of the total defense budget and is an absolutely staggering amount in relationship to our other environmental problems and programs to remedy environmental damage such as Superfund. And it appears that just to clean up Oak Ridge alone is going to cost several billion dollars.

So, I have worked for a number of years to assist and support the efforts of DOE to clean up the pollution of Oak Ridge. Mr. Chairman, I look forward to doing that in the future.

The problems of Oak Ridge and these other sites around the country are extremely serious. They merit our most diligent efforts. I am pleased to see that these issues have been receiving the attention at long last that they deserve of the Department of Energy, the General Accounting Office, and from you, Mr. Chairman, because of your leadership on this Committee.

Let me just lead into some quick questions. I know we have got to adjourn very shortly.

I am particularly interested in the cost estimates for the cleanup of the Oak Ridge facility in Tennessee. I do not believe you break down your cost estimates on a site-by-site basis. But it appears to me that from a review of your report and the testimony that the Oak Ridge cleanup alone may cost several billion dollars. I would like for you to specifically address the costs of cleanup at this site. Who could do that?

Mr. SALGADO. I can give you the Oak Ridge Y-12 area. We do have some figures in that area that do not encompass the laboratory, Senator. It is in the range of probably around a billion to a billion four for the Y-12 facility itself and not other areas.

Senator SASSER. I have worked with Joe LaGrone at the Oak Ridge facility for many years to try to help provide funding and assistance necessary to do an adequate and expeditious cleanup of the area. I have supported the Department of Energy's ongoing program of remedial action and have the highest hopes that this area can be restored to a safe condition just as soon as reasonably possible.

How about it? Can the Department of Energy stay on top of the situation there at Oak Ridge?

Mr. SALGADO. Obviously, we can stay on top of it. Joe LaGrone, as you are well aware, has made aggressive efforts in that area to maintain and to continue to move forward in monitoring and trying to take care of the remedial actions. Once again it turns into a question of budget constraint and restraint as we have to address these problems. Some of those problems, Senator, as you are well aware, are complex and are going to take a long time.

But I do believe we moved forward aggressively on monitoring, trying to identify those problems, and will continue to do so. We

will have a better handle on all of that problem with the Y-12 area in Tennessee probably by the December timeframe.

Senator SASSER. By the what timeframe, did you say?

Mr. SALGADO. December, sir. The completion of the defense programs study the modernization study and the rest of our nondefense activities, will be submitted in the December 1988 timeframe.

Chairman GLENN. Will you yield for just 1 second?

Is that being done at your own volition? You are putting that together in your report on this thing?

Mr. SALGADO. Yes, sir. That is part and parcel of the entire operation of that baseline survey activity and the modernization study that was requested by the Congress.

Chairman GLENN. Good.

I would like to request that it be delivered to us when it is ready just as soon as we can get hold of it, because we would like to continue to work on this.

Mr. SALGADO. It will be done, Mr. Chairman.

Chairman GLENN. Good.

Thank you.

Senator SASSER. One final question, Mr. Chairman, and I will submit the rest of the questions for the record.

What steps are currently being taken at Oak Ridge?

Mr. SALGADO. I would ask Mr. Berube to give you an analysis of that, sir.

Mr. BERUBE. As you are probably well aware, Oak Ridge has three components to it: the Y-12 weapons facility, the Oak Ridge National Lab, and also the gaseous diffusion plant. Now, I am more familiar with the activities at Y-12. In that connection we have post-closure activity that is under way. Again, that involves studies, but it will lead to corrective measures, post-closure activities in connection with RCRA requirements at Y-12. There is also being work planned for the East Fork of the Poplar Creek cleanup and a host of other, what are called in the RCRA universe, RCRA facility assessments and RCRA facility investigations. That is the RCRA counterpart to the Superfund cleanup process.

At Oak Ridge, EPA Region 4 decided to use RCRA to direct cleanup at the Oak Ridge facility in connection with the RCRA 3000 (4)u permit. That activity is under way.

Mr. SALGADO. We will provide the rest of that, Senator, for the record as to the other facilities there.[1]

Senator SASSER. Thank you, gentlemen.

Thank you, Mr. Chairman.

Chairman GLENN. I have just one last question here. I was thinking about the dollars here. Do we have the manpower if we had more money?

Mr. SALGADO. Sir, I think that a lot of the work and the expertise will probably be in the private sector and will be through contracting. And I am not quite sure that we have the manpower.

We face the same problem in the nuclear safety arena, as Mr. Starostecki knows, of trying to recruit the qualified technical manpower to move into the system even for our own internal oversight.

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[1] See p. 63.

A lot of that activity probably has to be done in the private contracting world, but we could address the long-term process by which we need to infuse new people into our system as well as develop that expertise in the outside.

Chairman GLENN. Yes, but you do not have the people in house. Are there enough experts? Are there enough groups out there or enough people that are available just to contract with to get started on this thing?

Mr. SALGADO. Probably not, but there will be more and more people moving into that area, Senator, I am sure. But probably not, in all seriousness, probably not. I think in the next decade or two, as this problem grows not only within the DOE, but also in the Defense Department, the Federal Government and the private sector, I am sure more and more expertise, research and development and more personnel will be moving into it. This is not just a DOE problem. It is a national problem in the private sector as well as the public sector.

Chairman GLENN. I concur with that. And we have been laggard too long in getting going on it. We have had hearings before and thought we were moving ahead, and then it sort of fell in the crack. I just wish we could keep some attention focused on this thing.

Mr. Starostecki, you have been notably quiet here as everybody else has performed this morning. Do you want to have the last word this morning?

Mr. STAROSTECKI. No, I have nothing further.

Chairman GLENN. Well, after the remarks that Mr. Salgado made earlier, I understand that ending to this.

Thank you. It has been a good hearing this morning. I have appreciated this—a lot of good information on this.

I hope you come in with a budget that is well in excess of that $1.4 billion so we can get going on some of these things. Thank you.

The hearing will stand in recess subject to the call of the Chair.

[Whereupon, at 11:30 a.m., the hearing was recessed, subject to the call of the Chair.]

APPENDIX

BROCK ADAMS *of Washington*

FOR IMMEDIATE RELEASE
July 13, 1988

CONTACT: Barbara Smith
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TESTIMONY OF SENATOR BROCK ADAMS BEFORE THE GOVERNMENTAL AFFAIRS COMMITTEE ON NUCLEAR WASTE CLEAN-UP COSTS

First I want to commend John Glenn, the chairman of this committee, for his leadership on this issue. He has worked diligently for many years through this committee and through the General Accounting Office to force to the surface the issue of environmental compliance and clean-up of Department of Energy facilities. After years of prodding, Senator Glenn has finally gotten the Department to provide a written estimate of what the Department believes it will actually cost to clean-up its facilities.

Although the estimate is incomplete and although witnesses from the General Accounting Office will confirm this morning that there are flaws and omissions in the Department of Energy's recent report, I think this should not diminish the importance of Senator Glenn's accomplishment. Those of us who represent states that host DOE nuclear facilities are in his debt for forcing DOE through this exercise and revealing the enormity of the problem.

The costs of clean-up reported by DOE are truly staggering; as much as $110 billion. Almost half of this cost is attributable to Hanford. The actual costs are, in my view, likely to be even higher. For example, there are obvious omissions in the DOE report such as the costs of major high-level waste programs. The costs of construction of the Hanford Vitrification Plant and disposal of high-level waste and transuranic wastes at Hanford are not fully included.

The costs of these additional clean-up programs at Hanford, as reported in the Department's Environmental Impact Statement on Disposal of Hanford Defense, High-Level, Transuranic and Tank Wastes released last December, may be as high as $18 billion. In addition, of course, the DOE estimate does not include the costs of long-term monitoring and maintenance nor the costs of decommissioning many DOE facilities.

When one talks of costs of over $100 billion to clean up the Federal government's own nuclear facilities, almost half of which is attributable to the Hanford Reservation in my state, it is clear that we have a serious national problem on our hands.

It is also evident that the era of self-regulation of the Federal government's nuclear weapons and materials production has left us a terrible legacy both in terms of environmental contamination and financial obligation. It has also left the nation with an unsafe, outmoded and decrepit defense production complex. The Congress has taken some initial steps toward straightening out this mess by adopting the concept of an independent safety board for DOE as proposed in Senator Glenn's bill, S. 1085, which I was pleased to co-sponsor.

Earlier this year, I introduced legislation, S. 2189, the "Federal Nuclear Facilities Environmental Restoration and Management Act," aimed at putting in place a comprehensive program for dealing with the cost, regulatory, and research needs of what we all know will be a massive undertaking: the clean-up of DOE's nuclear facilities.

Briefly, S. 2189, which was introduced in the House by my colleague from Washington state, Rep. Don Bonker, would provide the following elements:

1) A trust fund to pay for the billions of dollars of clean-up, decommissioning, long-term monitoring and environmental compliance costs the DOE faces. In addition to direct appropriations to the fund, funds would be transferred from DOE nuclear energy, enrichment, and defense accounts in proportion to the contribution of those programs to the clean-up problem. DOE would also be directed to recover the proportional costs from commercial and federal agency users of DOE facilities for clean-up, decommissioning and long-term care. Fines, fees and penalties for violations of federal environmental laws would also be deposited in the fund.

2) Legally enforceable compliance agreements, to include federal and state regulatory agencies, to assure timely compliance by DOE with federal environmental laws.

3) An office of special counsel at the U.S. Environmental Protection Agency to enforce federal environmental laws at all federal facilities.

4) Coordination of DOE and EPA environmental R&D programs to provide more efficient development of new environmental clean-up technologies for use at DOE facilities.

I have offered this legislation, which was referred to the Environment & Public Works Committee, as a starting point for the congressional debate on how we address the problem of clean-up and compliance at DOE facilities.

I look forward to working with Chairman Glenn and this committee on this long overdue task. His leadership has given us a valuable information base upon which to build.

United States General Accounting Office

GAO Testimony

For Release
on Delivery
Expected at
9:30 a.m. EDT
Wednesday
July 13, 1988

Dealing With Major Problem Areas in the Nuclear Defense Complex Expected to Cost Over $100 Billion

Statement of J. Dexter Peach
Assistant Comptroller General
Resources, Community, and Economic
Development Division

Before the
Committee on Governmental Affairs
United States Senate

Mr. Chairman and Members of the Committee:

Over the last few years, we have issued over 30 reports--many to you and this committee--that identify problems associated with the Department of Energy's (DOE) nuclear defense complex. My testimony today focuses primarily on our two most recent reports.[1] One addresses the enormous cost in dealing with problem areas within the complex and the other with a continuing theme of our work--strengthening oversight at DOE facilities. The three major problem areas that DOE faces are

-- upgrading existing capability to meet nuclear defense needs and to ensure that these capabilities are operated in a safe and environmentally acceptable manner,

-- environmental restoration to clean up existing contamination at DOE installations around the country, and

-- safely disposing of radioactive wastes and decontaminating nuclear facilities.

Our analysis of DOE's preliminary data indicated it will cost anywhere from $100 billion to over $130 billion to address problems in the DOE complex. This includes about $20 billion to upgrade existing facilities, $35 billion to $65 billion for environmental restoration, and over $45 billion to dispose of radioactive wastes and to decontaminate facilities. I would like to stress that this cost information is not budget quality information and should only be used to illustrate the magnitude of effort needed to address the problem areas. The overall figures do not include the day-to-day

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[1]Nuclear Health and Safety: Dealing With Problems in the Nuclear Defense Complex Expected to Cost Over $100 Billion (GAO/RCED-88-197BR, July 6, 1988) and Nuclear Health and Safety: Oversight at DOE's Nuclear Facilities Can Be Strengthened (GAO/RCED-88-137, July 8, 1988).

operational costs associated with producing nuclear material and weapons and ensuring compliance with existing standards. Finally, it does not include expanded capability or relocation of existing capabilities within the complex. According to DOE information, expanded capabilities and relocation could add another $15 billion to $25 billion to the overall cost.

I would now like to briefly discuss the major problem areas and point out important differences between our study and DOE's July 1, 1988, report entitled Environment, Safety, and Health Report for the Department of Energy Defense Complex.

UPGRADING EXISTING CAPABILITY

Much of DOE's nuclear defense complex was built in the 1940s and 1950s, and many facilities are approaching the end of their useful life. Some have deteriorated to the point where they now have safety or operational problems. Others are expected to deteriorate rapidly in the near future. In addition to aging, many facilities were constructed to comply with less stringent codes and standards than exist today. Finally, some equipment and/or processes used within the complex have become obsolete, making repair work difficult and spare parts virtually impossible to procure. Overall, the current condition of some facilities in the complex has resulted in safety concerns that could lead to prolonged shutdowns, thus threatening the nation's ability to produce nuclear weapons.

In 1987, DOE assessed major facilities in the complex as part of a strategic planning effort. A key part of this effort was to assign a fragility rating to the facilities. The rating system used a scale of from one to five, where three meant the condition of the facility was "average for industry," four meant the condition was "marginal" in need of constant attention, and five meant the condition was "serious" with no near-term solution. This

rating system allowed the flexibility of rating a facility below "industry average" (between three and four) and less than "marginal" (between four and five). The ratings were done by officials at the facilities and not by an outside, independent group.

Many DOE facilities were rated below the "industry average," "marginal," or less than "marginal." The Savannah River Plant reactors in South Carolina were rated less than "marginal." The "marginal" facilities included a number of buildings at the Rocky Flats Plant in Colorado, a key operation at the F-area separation facility at the Savannah River Plant, some operations at the Feed Materials Production Center in Ohio, and some operations at the Y-12 Plant in Tennessee. Two other important facilities were rated below the "industry average"--the N-Reactor in Washington and the Idaho Chemical Processing Plant in Idaho.

Because many of the facilities have been operating for 30 years or more, the equipment has deteriorated to the point where it requires constant attention. Some facilities have unique safety or operational problems that warrant their marginal condition. For example, concerns about the emergency core-cooling system at the Savannah River Plant reactors have resulted in those reactors having their power levels reduced three different times in the last 18 months. They are now only allowed to operate at about half their designed power levels. Technical and design problems with one of the plutonium operations at Rocky Flats have resulted in the operation's being shut down. Finally, safety, health, and environmental upgrades are necessary at these facilities to bring them into compliance with today's codes and standards. For example, areas at the Savannah River Plant reactors and the F-area separation facility do not meet fire protection codes.

DOE data on upgrading costs indicated that about $20 billion is necessary to maintain the nation's existing capability for

producing nuclear weapons and to ensure that the capability is operated in a safe and environmentally acceptable manner. These costs are preliminary and subject to change as more detailed plans are developed. Further, we believe these costs could increase as further assessments are conducted at DOE facilities. For example, in our recent July 8, 1988, report, we pointed out that DOE has not clearly defined its nuclear facilities' safety policy, including what commercial standards should be applied to DOE facilities. We further pointed out that DOE does not have a formal program to systematically assess the extent to which its nuclear facilities meet commercial standards. Until the safety policy is established and assessments are made to determine the extent to which the policy is met, DOE will not be in a position to identify all necessary upgrades. It is quite likely that further costly upgrades will be necessary to ensure the safe operation of facilities in the complex.

ENVIRONMENTAL RESTORATION

Besides upgrading existing capabilities, DOE faces a massive cleanup effort at various locations around the country. For over 30 years, hazardous and radioactive wastes have been disposed of at many DOE locations. In many cases, wastes were disposed of in a manner that allowed them to enter the environment. As a result, DOE now faces two interrelated problems at virtually all of its installations--groundwater contamination and inactive waste sites.

Groundwater at most DOE installations is contaminated to various degrees with hazardous and/or radioactive material. At many DOE installations, the on-site groundwater contamination levels are hundreds or, in some instances, thousands of times above the drinking water standards. Further, at a few installations, the groundwater contamination has spread off-site or into rivers. Interrelated with the groundwater problem are inactive waste sites, one of the principal causes of groundwater contamination. These

waste sites are a continuing problem in themselves because large amounts of hazardous and radioactive wastes are present and can cause further groundwater contamination or spread into the surrounding soil and move off-site. Virtually all DOE installations have inactive waste sites.

The amount of cleanup costs is very uncertain at this time because the full extent of the problems may not be known and the extent of cleanup is uncertain. DOE does have preliminary data which indicate that the cleanup cost could range from $35 billion to $65 billion. These figures are subject to change, depending on the cleanup method chosen and the level of cleanup decided upon by DOE, the Environmental Protection Agency, and state governments. In any event, it may not be possible to totally clean up some installations; thus they may require long-term institutional care.

DISPOSING OF RADIOACTIVE WASTES AND DECONTAMINATING EXISTING FACILITIES

Another major problem DOE faces is disposing of radioactive wastes and the cleanup of contaminated facilities. DOE has been temporarily storing high-level radioactive waste[2] and transuranic[3] waste for eventual disposal in geological repositories. DOE also routinely disposes of low-level radioactive waste.[4] Finally, DOE

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[2]High-level waste is generated in producing nuclear material. It is characterized by high levels of radiation and heat, and must be handled with special equipment.

[3]Transuranic waste is material contaminated with man-made elements heavier than uranium. This material is generally toxic and long-lived.

[4]Low-level radioactive waste generally decays within a few months or years and usually requires no shielding for handling.

must eventually decontaminate its nuclear facilities at the end of their useful life.

DOE has detailed plans for solidifying high-level radioactive waste and encapsulating it for disposal in a geological repository. It estimates the cost for high-level waste disposal at about $20 billion over the next 25 years. In the case of transuranic waste, DOE plans to use special facilities to prepare and package this waste for final disposal in a geological repository--the Waste Isolation Pilot Plant in New Mexico. For low-level waste, DOE plans to process and dispose of some of this waste using improved confinement techniques. DOE estimates it will cost about $10 billion over the next 25 years to dispose of transuranic and low-level waste.

Finally, DOE has hundreds of buildings that require special cleanup at the end of their useful life to remove radioactive material that has contaminated the facilities. DOE estimates that decontaminating its nuclear facilities could eventually cost over $15 billion.

DIFFERENCES BETWEEN GAO'S REPORT AND DOE'S JULY 1, 1988, REPORT

DOE recently provided you a report regarding corrective actions needed to address environmental, safety, and health problems and carry out ongoing compliance activities. That report estimated it would cost from $66 billion to $110 billion for corrective action and compliance activities. There are three important differences between the cost estimates in our report and those in DOE's report.

First, our report includes a discussion on disposing of radioactive wastes and decontaminating nuclear facilities estimated to cost over $45 billion. DOE's report does not address this

problem area. We believe the permanent disposal of radioactive wastes and decontaminating nuclear facilities is a long-standing problem that DOE must eventually address. It also has important environmental and safety implications. Accordingly, we believe any discussion of DOE problem areas should include radioactive waste disposal and decontaminating nuclear facilities.

Second, DOE's report provides cost on its "base" environmental, safety, and health program. This "base" program is the day-to-day activities to ensure compliance with environmental, safety, and health requirements and is estimated to cost $40 billion through 2045. We consider this cost a normal cost of doing business that would be necessary whether DOE had any problems or not. They are not reflected in our report. The cost estimates presented in our report are to illustrate the magnitude of effort needed to address the major problem areas over and above the day-to-day cost of making nuclear weapons.

The last major difference concerns upgrading DOE facilities. In our report, we included upgrades needed because of operational problems (e.g., deteriorating equipment) as well as environmental, safety, and health upgrades. We believe this is appropriate because operational problems can result in shutdowns and thus affect this country's ability to make nuclear weapons. Further, in many cases, operational problems are closely linked to or can lead to environmental, safety, or health problems. For example, at Rocky Flats, a new building was built to lower workers' radiation exposure levels and reduce the danger to the public in the event of an earthquake and/or high winds. This building never became fully operational because of technical and design problems. Upgrades included in our report are aimed at not only correcting the operational problems with this building, but also will result in some plutonium processes, being discontinued in old buildings that have been the subject of safety concerns.

Attachment I explains in more detail the major differences between the GAO and DOE reports. For example, you can see that we included $45 billion for disposal of radioactive waste and decontaminating facilities while DOE did not. We believe our report provides a more comprehensive picture of the level of effort needed to address the major problem areas facing DOE over and above the normal operating expenses.

SUMMARY

Let me close my testimony by calling attention to key GAO recommendations resulting from our work done for this Committee that remain important today, namely,

-- the need for outside, independent oversight of DOE operations and

-- a comprehensive strategy to address the problem areas of the nuclear defense complex.

Outside, independent oversight is needed to ensure that DOE's nuclear defense complex is safe and environmentally acceptable. Such an organization should also play a key role in DOE's rebuilding and/or restructuring of the complex. The comprehensive strategy is necessary to clearly show how the major problems will be addressed. DOE's recent study along with an ongoing modernization study could provide the framework for the comprehensive strategy that we have recommended.

Finally, the cost estimates discussed here today highlight the formidable task ahead in weighing the enormous cost of correcting problem areas in the nuclear defense complex against competing budget priorities in a deficit-conscious era. Further, fundamental questions such as "What should our nuclear capabilities be?"; "How clean is clean?"; and "How safe is safe?" will

continually be asked as DOE restructures, rebuilds, and cleans up the nuclear defense complex. The answer to these questions, and the need to set priorities will provide difficult choices for the Congress and for current and future administrations.

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Thank you, that concludes my testimony. I would be happy to answer any questions.

ATTACHMENT I

ATTACHMENT I

EXPLANATION OF GAO AND DOE COST ESTIMATES

	GAO Report[a]	DOE Report[b]	Explanation of difference
	(Billions)		
Upgrading existing capability	$20	$5	DOE's report was limited to environmental, safety, or health upgrades
Disposal of radioactive wastes and decontamination of facilities	45	-	Item not addressed in DOE report
Environmental restoration	35-65	35-65	-
Cost to maintain compliance with existing standards	-	26-40	Not included in GAO report
Total	$100-$130[c]	$66-$110	

[a]Nuclear Health and Safety: Dealing With Problems in the Nuclear Defense Complex Expected to Cost Over $100 Billion (GAO/RCED-88-197BR, July 6, 1988).

[b]Environment, Safety, and Health Report for the Department of Energy Defense Complex, dated July 1, 1988.

[c]These are not budget-quality estimates but they do illustrate the magnitude of effort needed to address the problem areas in the DOE nuclear weapons complex over the next 25 years. GAO's report also included DOE information showing that expanded capability and relocation cost could add another $15 billion to $25 billion. Furthermore, GAO's report did not include the day-to-day costs to produce nuclear material and weapons or activities to ensure compliance with standards and laws.

(301820)

Hearing Before the
Senate Committee on Governmental Affairs
J. F. Salgado, Acting Deputy Secretary
U. S. Department of Energy

Mr. Chairman, thank you for the opportunity to testify before your committee on the Department of Energy's (DOE) efforts to address environmental and safety concerns at the Department's defense production sites. Accompanying me today are Troy E. Wade, Acting Assistant Secretary for Defense Programs, Raymond P. Berube, Deputy Assistant Secretary for Environment, and Richard W. Starostecki, Deputy Assistant Secretary for Safety, Health and Quality Assurance.

SECRETARY HERRINGTON'S PERSONAL COMMITMENT

Secretary Herrington has made a personal commitment to operate DOE's facilities in a safe and environmentally sound manner. The Secretary put his commitment into action by adopting major initiatives in the environment, safety and health (ES&H) area in September 1985.

These major initiatives included:

(1) Establishing a new Office of Environment, Safety and Health, with functions and resources consolidated under a new Assistant Secretary for ES&H. From 1985 to 1988, despite growing Departmental resource

constraints, the budget of this office grew by 80 percent and its staffing level by 62 percent.

(2) Conducting a baseline Environmental Survey of DOE facilities to identify existing environmental problems and areas of potential risk and to prioritize corrective actions DOE-wide.

(3) Conducting Technical Safety Appraisals of DOE's nuclear facilities to determine compliance with safety requirements, industry lessons learned, and licensed facilities requirements. These are on-site technical appraisals of all aspects of safety, including nuclear reactor safety, nuclear process facility safety, health physics, training, emergency preparedness, occupational medicine, occupational safety, fire protection safety, and transportation and packaging safety.

THE SECRETARY'S ENVIRONMENTAL POLICY

As a further initiative to ensure that his environmental commitment was put into action, the Secretary issued, in January 1986, a written Environmental Policy Statement governing all DOE operations. The policy statement contains four major points.

First, as a matter of public trust, the Department considers it an obligation to conduct its operations in a safe and environmentally sound manner.

Second, the Department will conduct its operations in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards.

Third, the Department pledges itself to exercise good environmental management by seeking to minimize risks to the environment or the public health.

And fourth, DOE expects its operating contractors to share the Department's commitment to good environmental management and to conduct their operations in an environmentally sound manner.

Let me assure you that these are more than just words on a piece of paper. The Department takes these commitments seriously and has put them into action. I would like to demonstrate that with a few very important examples.

The first example deals with the subject of mixed waste. As a direct application of the Secretary's Policy Statement, the Department conducted an internal review of the issue of mixed waste to determine whether DOE's position at that time was consistent with the Policy Statement. The review resulted in a DOE decision to abandon its previous position. It also resulted in the DOE May 1, 1987, rule which subjects DOE's mixed waste to EPA and state regulation under RCRA.

Another example of the Secretary's Policy Statement being put into action is

the number of environmental compliance agreements we have reached with EPA and the states. Since 1985, we have signed 29 compliance agreements with EPA and/or the states, compared to 4 such agreements prior to 1985. These compliance agreements are roadmaps for correcting environmental compliance problems at DOE facilities.

ENVIRONMENTAL RESTORATION

The Department recognizes its responsibility to correct the legacy of environmental contamination problems that exist at our facilities. We also recognize that our progress to date may be viewed as slow. However, the scope and technical complexity of these problems preclude quick solutions. On the contrary, most of the problems require time-consuming detailed studies to fully define the nature and extent of the problems and to design solutions that will be effective and that will last. In addition, because the legacy of problems is so large, we must have a means to establish priorities to ensure that the more serious problems are corrected first.

I would like to highlight for you some of the major efforts the Department has underway to meet its responsibility to correct the legacy of environmental contamination problems. These efforts will enable us to develop the long-range management systems and planning necessary for effective long-term solutions.

First, to address the need for establishing priorities for corrective actions, the Environmental Survey I mentioned earlier was initiated. The Survey is a 3-year, $60 million program covering all major DOE sites and all types of environmental problems. The principal product of the Survey will be a DOE-wide ranking of priorities for corrective action that will enable us to address the more serious problems first. At this time, we have completed over one-half of the Survey program and plan to issue a preliminary ranking of problems at our 16 defense production facilities next month. Since these 16 facilities, because of the nature of their activities, are likely to contain the vast majority of DOE's most serious problems, the preliminary ranking report will provide critical input to our planning efforts.

Second, the Department is making significant progress in conducting Superfund-type studies of environmental contamination at all DOE sites. For example, we have completed preliminary assessments for over 1500 inactive waste sites, leak areas, and spill areas. These preliminary assessments provide the basis for determining whether more detailed studies, called remedial investigations, are needed. In addition, these preliminary assessments provide the information EPA needs to score the sites and to determine if they are to be included on the National Priorities List (NPL).

Third, to improve management of DOE environmental remedial actions, the Department in mid-1987 decided to consolidate all environmental remedial actions at the Defense Programs facilities into an Environmental Restoration Program. This decision reflects the Department's understanding of the large

mortgage to cleanup environmental contamination and the need to separately budget for remedial actions.

Fourth, we have a number of related planning activities underway that we believe will pull together the many pieces of this complex puzzle and enable us to greatly increase progress. One such planning activity is the report we provided to you recently which is entitled Environment, Safety and Health Report for the Department of Energy Defense Complex . Another closely related activity is the expansion of the recent report to include all DOE facilities. I have committed to submit the expanded report to Congress by December 31, 1988.

SAFETY PROGRAMS

I would now like to share with you some of the efforts and accomplishments we are making in the Department's safety program.

First, the Department in response to the NAS recommendation, moved immediately forward to establish an Advisory Committee on Nuclear Facility Safety. This independent advisory committee is composed of recognized experts with broad technical experience and affiliations, and reports directly to the Secretary. John Ahearne, a former chairman of the Nuclear Regulatory Commission, agreed to serve as chairman. This Committee has already met three times, and will be convening in Richland, Washington next week. The Committee sessions have been technically probing ones, with a considerable amount of exchange between Committee members, and DOE and operating contractor staff. It is clear that the intended purpose of the oversight group is being realized and a first round of recommendations is anticipated soon.

Second, we are continuing progress with the Technical Safety Appraisal (TSA's) Program and have completed 27 of 52 TSA's.

Third, following the Chernobyl accident in April 1986, the Secretary directed a number of special safety reviews:

- o A special safety review panel of nationally recognized scientific and technical experts, the Roddis Group , was established to help review N Reactor.

- o The National Academy of Sciences and the National Academy of Engineering were requested to provide an independent assessment of safety and technical issues at the Department's 11 Class A reactors.

- o The Department's ES&H staff conducted a special safety review of graphite fire protection and the confinement system at N Reactor.

- o A Design Review of the N Reactor and the Savannah River production reactors was conducted by the ES&H staff.

- o The schedule for the Technical Safety Appraisal at the N Reactor was accelerated.

As a result of these special reviews, the N Reactor was placed in stand-down in January 1987 for refueling, routine maintenance, and accelerated

implementation of safety enhancements. At Savannah River, DOE reduced operating power levels by twenty-five percent when it identified significant uncertainties in the data used to determine the safety margins in the event of a severe accident. Subsequently, after consultation with the NAS, DOE further reduced power levels by approximately another twenty-five percent to maintain the safety criterion. Based on further evaluation of supporting ECCS analyses and assumptions, the operating level at L Reactor was further reduced to about 45 percent.

Other examples of the Department's commitment to safety as a precondition for operation include the four month shutdown of PUREX and the current shutdown of the Plutonium Finishing Plant at Hanford due to deficiencies in criticality safety procedures and quality control. Similarly, operations at the HFIR reactor and other research reactors at Oak Ridge were suspended based on violations of technical safety specifications, and because of management and quality assurance deficiencies, respectively. In both of these instances, the principal line manager, the Operations Office Manager, ordered the suspension of operations when these violations became known.

In October 1987, the NAS completed their report on the Department's production reactors. The Secretary immediately directed the Department to take action to respond to the NAS committee's recommendations, including the establishment of the previously mentioned Advisory Committee on Nuclear Facility Safety. In addition, action plans were developed for strengthening DOE's internal safety oversight, for revising the DOE Order system and safety standards, and for implementing technical recommendations made by the National Academies. The Department's actions have been prompt and deliberate and include:

- Expansion and restructuring of the Headquarter's safety function. The FY1989 Presidential Budget submission request $110 million for ES&H, a 63 percent, increase over FY1988. In terms of personnel, an additional 100-150 positions have been requested in the FY1988-1990 timeframe. This includes for the first time on-site ES&H personnel reporting to the Headquarters' safety organization and serving as independent safety monitors. Key functions have been added organizationally, including performance evaluation, compliance verification, and a safety technology division.

- DOE has executed an agreement with the Institute of Nuclear Power Operations (INPO) that will provide access to current industry data and to INPO technical assistance. As a means to complement the INPO agreement and enhance contractor technical capabilities, the Department is also initiating a contractor self-improvement program.

- To assure clearer and more timely safety policies and standards, the process by which ES&H Orders are developed, coordinated, and issued has been completely revamped.

- In response to the NAS recommendation regarding a well-founded DOE safety framework with clear safety objectives and Orders, a number of steps are being taken:

  --DOE safety objectives have been developed which will apply not only to the production reactors, but to a broad range of DOE nuclear facilities. The objectives include nuclear safety performance criteria which establish minimum standards against which the Department's nuclear facilities will be designed and operated.

  --Safety policy development initiatives are underway in several key areas identified by the NAS including severe accident analysis, use of probabilistic risk assessments, facility upgrades. and emergency preparedness. The near-term goal is to issue Departmental policies and Orders establishing the objectives, elements, and uniform implementation of these fundamental aspects of the Department's safety program.

  --Accelerate an ongoing assessment of the completeness, comparability, and consistency (e.g., with safety objectives as they are developed) of

existing DOE safety Orders. This will be one of the major roles of the newly centralized safety policy and standards function being established in the Headquarters safety organization.

In the area of facility safety, Secretary Herrington has stated repeatedly that our operating facilities must perform at a high level of safety. Safety is an integral and inextricable part of our nuclear operations. The Department has testified last year that we will not allow a known unsafe facility to operate. Nevertheless, the Department is dealing with a complex of aging facilities. At least for the near-term, these facilities will require our full attention to assure that the design, operations, and personnel practices not only satisfy minimum standards, but achieve the Secretary's goal of excellence, i.e., to increase margins of safety by seeking optimal performance. For safety and health protection, facility and operational upgrades were projected as part of an ongoing study of the defense complex. The projections used in the recent report submitted to you reflect available information at the individual sites. We believe they can be further refined. Consistent with the recommendations of the National Academies of Science and Engineering report on the safety of the DOE production reactors, the Department is developing safety objectives, safety performance criteria, and policies governing safety goals, nuclear facility backfit and safety analyses. These policies, when issued, will establish guidelines, criteria and processes by which facility safety enhancements can be consistently and uniformly evaluated and implemented. They will establish the necessary goals for the Department in safety and health, and will provide a more rational

basis for decision-making on priorities and schedules of facility safety enhancements.

CONCLUSION

In recent years, the Department has moved aggressively to address environment and safety issues at our Defense Programs nuclear facilities. Some clean-up actions are underway, and plans to prevent future problems are being implemented. In addition, we are developing the structure and information necessary for a long-term solution to ES&H concerns.

The recent report submitted to you does not establish scheduling and planning milestones, budget projection over certain time periods, or annual goals for specific actions. These plans cannot be produced without the information obtained from ongoing studies and assessments, and until Congress and the Executive Branch have agreed on strategies and budgetary priorities.

As our recent report shows, substantial amounts of time and financial resources are necessary to complete this task. Because of tight budgets and the need to reduce the Federal deficit, decisions about the allocation of Federal resources must be made in the context of budget priorities that are

established outside of the Department of Energy. This is a difficult issue which Congress and the Executive Branch must address together in the years to come.

The Department is in the process of completing a report on the cost for cleanup of the DOE non-defense sites. This report will be submitted to congress December 31, 1988. We are attaching the data on the Oak Ridge defense sites clean up costs.

Appendix J

SUMMARY OF THE OAK RIDGE, Y-12 PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The Oak Ridge Y-12 Plant, managed by Martin Marietta Energy Systems, Inc., and administered by the DOE Oak Ridge Operations Office, has progressed from its original single mission of electromagnetic uranium separation in 1943 to having the following present day, primary missions:

- o Production of nuclear weapon components,
- o Fabrication support to Department of Energy weapon design laboratories,
- o Processing of source and special nuclear material,
- o Support for Oak Ridge National Laboratory facilities and Martin Marietta Energy Systems General Staff located at the Y-12 Plant site, and
- o Support for other government agencies.

II. KEY AREAS OF ES&H FOCUS

The Department of Energy (DOE) has identified the following as key areas for future Environmental, Safety, and Health activities at the Y-12 Plant.

Improvement of the Quality and Reduction in the Quantity of Y-12 Plant Effluents

Improvement of the quality and reduction in the quantity of Y-12 Plant effluents has been the major focus of environmental activities at the Y-12 Plant since 1983. Included are the construction and operation of major emission control projects, waste treatment, storage and disposal facilities, construction and upgrade of effluent monitoring capabilities, and establishment of an administrative program to ensure proper functioning of these facilities and compliance with environmental regulations. Major proposed line item projects are listed below. Among these projects, the Steam Plant Ash Disposal Facility will be needed to

attain compliance with State of Tennessee water quality requirements, while the remaining projects will be constructed to maintain compliance with applicable regulations.

- Steam Plant Ash Disposal Facility ($12.8 million),
- Production Waste Storage Facility ($25.0 million),
- Sanitary Wastewater Treatment Facility ($25.0 million),
- Non-Rad Emission Control and Monitoring Improvements ($16.5 million), and
- Stack Emission Reduction and Monitoring ($17.6 million).

Remediation of Surface Impoundments, Landfills, and Off-Site Contamination

Preparation for and planning of remedial activities at the Y-12 Plant has been underway since 1983. Site identification, characterization, remedial investigation, feasibility study preparation, conceptual design, and facility closure/remediation are in various stages of implementation at Y-12 Plant sites. Major current and proposed remediation initiatives are:

- Closure and Post-Closure Activities, Including the Bear Creek Waste Disposal Areas ($165.0 million),
- East Fork Poplar Creek Cleanup ($45.0 million), and
- Remedial Investigation of Solid Waste Management Units ($20.0 million).

Analysis, Documentation, and Correction of Worker Safety Concerns

A number of special studies have been conducted over the last several years directed toward assessing surfacing vulnerabilities and associated operating risks related to worker safety. Completion of all existing facility safety analyses and documentation is underway. Improvements to building structures, fire protection upgrades, and upgrade of electrical equipment are safety areas where substantial funds will be used for improvement in worker protection. Major proposed safety projects include:

- Fire Protection Upgrade ($8.5 million),
- Electrical Equipment Replacements ($4.0 million), and
- Building Structural Restorations ($3.3 million).

Reduction of Worker Exposure to Airborne Contaminants

Strong programs are in place for respiratory protection from uranium and non-uranium exposures; medical surveillance for uranium, beryllium, and asbestos workers; and fitness support for the Y-12 guard force. Major proposed improvement projects include:

- o Ventilation Systems Restoration ($60.0 million),
- o Personnel Radiation Monitoring Laboratory ($1.3 million), and
- o Uranium Contamination Containment and Control Improvements ($74.0 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Y-12 Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The remedial action strategy on-site assumes in situ stabilization of the majority of disposed wastes coupled with groundwater remediation where necessary, and off-site, the selected removal of contamination to meet criteria yet to be established. The difference between the "expected" and "high" number of years projections provided in Table 2 is due principally to the uncertainties in the length of time that will be required to complete groundwater remediation. The difference between the "expected" and "high" dollar projections presented in Table 3 is due to uncertainties in the scope of the actual efforts that will be required. In most of the Bear Creek disposal areas, closure without waste removal is expected; the high projection assumes limited removals of certain waste types, for example, pyrophoric materials. For the East Fork Poplar Creek area expected case, removal of soils contaminated with mercury above 100 parts per million was assumed; for the high case, a more restrictive criterion of 50 parts per million was assumed.

Resource projections to comply with increased radiation contamination control requirements are included in the safety and health category. While capital projects may need to be restructured, total resource requirements to comply with increased control requirements are included.

TABLE 1
OAK RIDGE Y-12 PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	37.0	39.0	40.0	45.0	45.0	48.0	48.0	48.0
Corrective Actions								
Air	3.0	1.0	1.0	1.0	3.0	4.0	6.0	4.0
Water	6.0	6.0	4.0	1.0	0.0	5.0	8.0	8.0
Solid Waste Management	3.0	1 0	9.0	7.0	5.0	0.0	5.0	5.0
Remedial Action	22.0	31.0	39.0	37.0	38.0	35.0	34.0	30.0
Subtotal, Environment	71.0	78.0	93.0	91.0	91.0	92.0	101.0	95.0
SAFETY AND HEALTH:								
Base Program	21.0	24.2	27.2	32.2	34.2	34.2	37.0	37.0
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	6.0	7.0	7.0	12.0	15.0	15.0	20.0	18.0
Non-Nuclear	11.0	27.0	46.0	27.0	22.0	26.0	19.0	19.0
Subtotal, Safety and Health	38.0	58.2	80.2	71.2	71.2	75.2	76.0	74.0
TOTAL ES&H	109.0	136.2	173.2	162.2	162.2	167.2	177.0	169.0

NA - Not Applicable

TABLE 2

OAK RIDGE, Y-12 PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	3	15
Water	6	15
Solid Waste Management(1)	2	15
Remedial Action	10	50
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	2	5
Non-Nuclear	3	10

(1) This excludes low-level radioactive waste treatment, storage, and disposal considerations.

NA - Not Applicable

TABLE 3

OAK RIDGE, Y-12 PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	290	530
Safety and Health	50	150
Total ES&H	340	680

United States General Accounting Office

GAO

Briefing Report to the Chairman, Committee on Governmental Affairs, United States Senate

July 1988

NUCLEAR HEALTH AND SAFETY

Dealing With Problems in the Nuclear Defense Complex Expected to Cost Over $100 Billion

GAO/RCED-88-197BR

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-222195

July 6, 1988

The Honorable John Glenn
Chairman, Committee on
Governmental Affairs
United States Senate

Dear Mr. Chairman:

Pursuant to your request, we have examined the major problem areas facing the Department of Energy's (DOE) nuclear defense complex. This complex produces nuclear material and weapons for defense needs. It consists of about 50 major facilities at various installations around the country. (See sec. 1.) Over the last few years, we have identified a number of specific as well as generic problems associated with the complex. As agreed to with your office, this report discusses the major problem areas facing DOE and provides a perspective on the cost needed to resolve them.

In summary, DOE faces three major problem areas: (1) upgrading existing capability to meet nuclear defense needs and to ensure that they are operated in a safe and environmentally acceptable manner, (2) environmental restoration to clean up existing contamination, and (3) safely disposing of radioactive waste and decontaminating nuclear facilities. While cost estimates are preliminary, our analysis of the most recent DOE cost data indicate that it will cost from about $100 billion to over $130 billion to address these problem areas.[1] These costs do not include expanded capabilities (e.g., new ways of making nuclear material) and the relocation of existing capabilities that DOE is examining as part of a modernization plan it will issue in December 1988. According to DOE information, expanded capabilities and relocation could add another $15 billion to $25 billion to the overall cost.

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[1]To a large degree, this cost information is not budget quality and should be used only to illustrate the magnitude of effort needed to address these problem areas over the next 25 years. The overall cost estimates do not include day-to-day operational costs to produce nuclear material and weapons and maintain compliance with existing standards.

UPGRADING EXISTING CAPABILITY

Much of DOE's nuclear defense complex was built in the 1940s and 1950s and although the facilities have been subject to upgrades, many are approaching the end of their useful life. Some have deteriorated to the point where they now have safety or operational problems. Others are expected to deteriorate rapidly in the near future. In addition to overall aging, many facilities were constructed, in some respects, to less stringent codes and standards than exist today. Finally, some equipment and/or processes used within the complex have become obsolete, making repair work difficult and spare parts virtually impossible to procure. Overall, the current condition of some facilities in the complex makes them susceptible to prolonged shutdowns and thus, threatens the nation's ability to produce nuclear material and components for weapons.

In 1987, DOE assessed all its major facilities in the complex as part of a strategic planning effort. A key part of this effort was to assign a fragility rating to all major aspects of each facility. The rating system used a scale of from one to five, where three meant the condition of the facility was "average for industry," four meant the condition was "marginal" in need of constant attention, and five meant the condition was "serious" with no near-term solution. This rating system allowed the flexibility of rating a facility below "industry average" (between three and four) and less than "marginal" (between four and five). The ratings were done by officials at the facilities and not by an outside, independent group. Finally, the rating system was designed to quickly identify the more severe problem areas and to facilitate any overall assessment of the complex.

In our review, we did not identify any operating facility in the complex that was rated by DOE as "serious." However, many were rated below the "industry average," "marginal," or less than "marginal." The Savannah River Plant (SRP) reactors in South Carolina were rated less than "marginal." The "marginal" facilities included a number of buildings at the Rocky Flats Plant in Colorado, a key operation at the F-area separation facility at SRP, some operations at the Feed Materials Production Center (FMPC) in Ohio, and some operations at the Y-12 Plant in Tennessee. Two other important facilities were rated below the "industry average"--the N-Reactor in Washington and the Idaho Chemical Processing Plant in Idaho.

In general, the condition of these facilities is due to age. Many have been operating for 30 years or more, and the equipment has deteriorated to the point where it requires constant attention. Some facilities have unique safety or operational problems that warrant their marginal condition. For example, concerns about the emergency core cooling system at the SRP reactors have resulted in those reactors having their power levels reduced three different times in the last 18 months. They are now only allowed to operate at about half their designed power levels. Technical and design problems with one of the plutonium operations at Rocky Flats have resulted in the operation being shut down. Finally, safety, health and environmental upgrades are necessary at these facilities to bring them into compliance with today's codes and standards. For example, areas at the SRP reactors and the F-area separation facility do not meet fire protection codes. (See sec. 2 for further details.)

DOE is currently developing cost estimates for modernizing the entire complex. Although these estimates are preliminary and are subject to change when more detailed plans are developed, they do illustrate the magnitude of effort needed to ensure that the nation continues to have the capability of producing nuclear weapons. DOE's data indicate that about $20 billion is necessary to maintain the existing capability and to ensure that this capability is operated in a safe and environmentally acceptable manner. This estimate includes one new production reactor and upgrades to existing facilities. It does not include expanded capabilities[2] or the relocation of capabilities within the complex. According to DOE information, expanded capabilities and restructuring of the complex may cost an additional $15 billion to $25 billion.

ENVIRONMENTAL RESTORATION

Besides upgrading existing capabilities, DOE faces a massive cleanup effort at various locations around the country. For over 30 years, hazardous and radioactive wastes have been disposed at many DOE locations. In many cases it was disposed in a manner that allowed it to enter the environment. As a result, DOE now faces two interrelated

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[2]These expanded capabilities include special isotope separations and a second new production reactor.

problems at virtually all of its installations--groundwater contamination and inactive waste sites.

Groundwater at most DOE installations (see sec. 2) is contaminated to some degree. At many installations including Hanford in Washington, SRP, FMPC, Rocky Flats Plant, Lawrence Livermore Laboratory in California, and the Y-12 Plant, the on-site groundwater contamination levels are hundreds or, in some instances, thousands of times above the drinking water standards. Further, at the Lawrence Livermore Laboratory, FMPC, Hanford, and the Mound Plant in Ohio, groundwater contamination has spread off-site or into rivers.

Interrelated with the groundwater problem are inactive waste sites, one of the principal causes of groundwater contamination. These waste sites are a continuing problem in themselves because large amounts of hazardous and radioactive waste are present and can cause further groundwater contamination or spread into the surrounding soil and move off-site. Some installations such as Hanford, Idaho National Engineering Laboratory (INEL) in Idaho, SRP, and the Rocky Flats Plant appear to have the more serious problems in terms of the number of inactive waste sites and/or quantity of waste buried there. (See sec. 3 for more detail on environmental restoration.)

We also noted in our review that the extent of contamination may not fully be known because of inadequate monitoring or procedural problems in sampling. For example, many inactive waste sites at Hanford do not have adequate groundwater monitoring. Procedural problems, such as an inadequate quality assurance program, have been identified at some DOE installations.

Cleanup costs are very uncertain at this time because the full extent of the problems may not be known and the level of cleanup necessary is uncertain. DOE does have preliminary data which indicate that the cleanup cost could range from $35 billion to $65 billion. DOE officials told us these figures are subject to change depending on the cleanup method chosen and the level of cleanup decided upon by DOE, the Environmental Protection Agency, and state governments. In any event DOE officials acknowledged that some installations may not be totally cleaned up and thus will require long-term institutional care.

DISPOSING OF RADIOACTIVE WASTES AND DECONTAMINATING EXISTING FACILITIES

The last major problem area DOE faces is disposing of radioactive waste and the cleanup of contaminated facilities. DOE has been storing high-level radioactive waste[3] and transuranic[4] waste for eventual disposal in geological repositories. DOE also routinely disposes of low-level radioactive waste.[5] Finally, DOE must eventually decontaminate its nuclear facilities at the end of their useful life.

High-level radioactive waste is currently stored at three installations around the country--Hanford, INEL, and SRP. DOE has detailed plans on solidifying the waste and encapsulating it for disposal in a geological repository. DOE estimates the cost for high-level waste disposal at about $20 billion over the next 25 years.

DOE is also storing transuranic waste and disposing of low-level radioactive waste at various installations around the country. In the case of transuranic waste, DOE plans to use special facilities to prepare and package this waste for final disposal in a geological repository--the Waste Isolation Pilot Plant in New Mexico. For low-level waste, DOE plans to process and dispose of some of this waste using improved confinement techniques. DOE estimates it will cost about $10 billion over the next 25 years to dispose of transuranic and low-level waste.

Finally, DOE has hundreds of facilities that require special cleanup at the end of their useful life to remove

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[3]High-level waste is generated in producing nuclear material. It is characterized by high levels of radiation and heat, and must be handled with special equipment.

[4]Transuranic waste is material contaminated with man-made elements heavier than uranium. This material is generally toxic and long-lived.

[5]Low-level radioactive waste generally decays within a few months or years and usually requires no shielding for handling.

radioactive material that has contaminated the facilities. DOE estimates that decontaminating its nuclear facilities could eventually cost over $15 billion. (See sec. 4 for further details on disposing of radioactive waste and decontaminating facilities.)

OBSERVATIONS

DOE faces a number of costly long-term problem areas which need to be addressed. Current data indicate that it will cost anywhere from about $100 billion to over $130 billion to address these problem areas. Further, expanded production capabilities and relocation of facilities could add $15 billion to $25 billion to the overall cost. The cost data presented in this report are preliminary and are subject to changes as detailed plans to address these problems areas are developed. In the final analysis the total cost may be even higher.

This situation presents a formidable task for the Congress and future administrations in weighing the enormous cost of correcting problem areas in the nuclear defense complex against competing budget priorities in a deficit-conscious era. Further, fundamental questions such as "What should our nuclear capabilities be?"; "How clean is clean?"; and "How safe is safe?" will continually be asked as DOE restructures, rebuilds, and cleans up the nuclear defense complex. The answer to these questions, and the need to set budget priorities in future years, will present difficult choices for the Congress and for current and future administrations.

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The information contained in this report was based on previous GAO reports and DOE assessments carried out on each of its facilities during 1987. We analyzed and used cost information currently being developed by DOE as part of its ongoing modernization study that is scheduled to be issued in December 1988. We also interviewed responsible DOE officials in headquarters and DOE field offices to gain a better understanding of the problem areas DOE faces and the cost to resolve them. This work was performed between February 1988 and June 1988 in accordance with generally accepted government auditing standards. We discussed the contents of this report with cognizant DOE officials, who generally agreed with the information presented. However,

as you requested, we did not obtain official agency comments on a draft of this report.

Unless you publicly announce its contents earlier, we plan no further distribution of this report for 30 days from the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Secretary of Energy; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

Major contributors to this report are listed in appendix I.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

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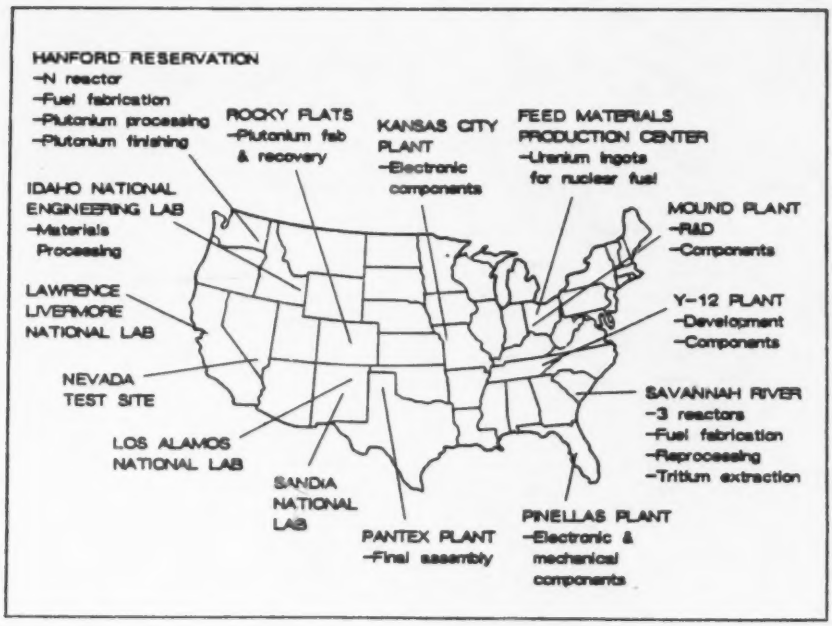
ABBREVIATIONS

D&D	decontamination and decommissioning
DOE	Department of Energy
GAO	General Accounting Office
FMPC	Feed Materials Production Center
INEL	Idaho National Engineering Laboratory
SRP	Savannah River Plant

SECTION 1

MAJOR SITES WITHIN THE NUCLEAR DEFENSE COMPLEX

Figure 1.1: Major Sites Within the Nuclear Defense Complex



SECTION 2

DOE FACILITIES IN NEED OF MAJOR UPGRADE

Much of DOE's defense complex was built in the 1940s and 1950s and many key facilities are approaching the end of their useful life. Others have deteriorated and as a result have safety and/or operational problems. As a result, major upgrades and/or new replacement facilities are needed. DOE data indicate that about $20 billion will be needed to maintain the nation's existing capabilities to make nuclear weapons and to ensure that the complex can be operated in a safe and environmentally acceptable manner. The following are examples of facilities which need major upgrades.

SAVANNAH RIVER PLANT (SRP) PRODUCTION REACTORS

- o The SRP production reactors are heavy-water reactors built in the mid-1950s. Three reactors are currently operational. Associated with the reactors are heavy-water facilities and powerhouses to supply back-up power in an emergency. The SRP reactors are rated "less than marginal" by DOE.

- o Major safety concerns are associated with SRP reactors.

  - -- One reactor has been shut down because of cracks in the reactor vessel. Although no cracks are known to exist in the three operating reactors, cracks could develop. DOE's current inspection practices, which have heavily relied on visual techniques, have not provided the best possible evidence that no cracks exist.

  - -- Power levels at all three of the reactors have been reduced because of uncertainties in the emergency cooling system's capabilities to prevent core melting in a severe accident.

  - -- Some braces used to support components of the reactors in the event of an earthquake were recently found to be in need of repair.

  - -- Fire protection systems do not meet National Fire Protection Association codes and standards. Corroded piping and insufficient water pressure are some examples.

- o There is general deterioration due to aging at the reactors and associated facilities.

  - -- For example, the powerhouses, which provide on-site electricity, are over 30 years old and prone to increased maintenance and unscheduled shutdowns. At

two of the three powerhouses, the cost to supply power is twice what a commercial company would charge.

- o DOE estimates it will cost $785 million to upgrade the reactors. This includes improvements to the existing confinement system and the emergency core-cooling systems.

ROCKY FLATS PLANT

- o The mission of the plant is to cast and machine plutonium components for weapons. The plant also is involved in producing other weapons components and plutonium recovery from scrap material and retired weapons. The plant was established in 1953, and many of its existing buildings were built in the 1950s.

- o Many aspects of the plant are considered "marginal."

  - -- Building 444 is used to manufacture nonnuclear components. This building needs a major rebuilding of its utility and piping system.

  - -- Buildings for plutonium assembly and waste management do not meet DOE's structural design criteria for tornados and earthquakes. Old equipment needs constant maintenance and has caused the operation to be shut down--about 20 percent of the time in recent years.

  - -- Building 771 is an old chemical plant needing continual repair of tanks, piping, and utilities. Aspects of the facility do not meet current building and safety codes. This building was once planned to be phased out.

- o Building 371 needs to be repaired. This building was constructed to replace other older buildings. However, all but one of the operations in the building never operated as intended because of technical and design problems (e.g., poor building design and inappropriate construction material). This has resulted in the continued operation of older facilities that this building was intended to replace.

- o The cost to rebuild and upgrade Rocky Flats is estimated to be about $1.5 billion. This includes more than $590 million to rebuild Building 371 and ensure continued plutonium recovery and about $398 million to upgrade plutonium manufacturing and assembly processes.

F-AREA SEPARATION FACILITY AT SRP

- The F-area separation facility constitutes a large chemical plant which chemically processes materials that have been irradiated in production reactors to recover uranium and plutonium. The primary operations include the F-area Canyon where irradiated material is dissolved and separated, the FA line which recovers uranium, and the FB line which recovers and processes plutonium. The facility became operational in the 1950s, and many aspects have been upgraded over the years.

- Aspects of the F-area separation facility are rated below the "average for industry."

  -- FA line needs additional restoration to replace ventilation and filtration systems which have deteriorated in 35 years.

  -- Equipment, instrumentation, wiring, and piping must be replaced periodically in the canyon because of deterioration.

  -- Fire protection systems in many areas of the facility are not in compliance with today's codes.

- The FB line at the facility is rated as "marginal."

  -- Employee radiation exposure on the FB line is about 10 times higher than in other areas at SRP and has doubled since 1983. The FB line requires substantial amounts of hands-on processing.

  -- Fire protection in most of the rooms within the FB line do not meet fire protection guidelines and codes.

  -- Physical constraints (design, space, etc.) prevent the installation of monitoring devices to achieve real-time accountability for measuring the amounts of plutonium in the system.

  -- Administrative controls, such as the reliance by operators on written procedures, are used, to a great extent, to prevent criticality accidents. New equipment would have automated criticality controls built into them and thus reduce reliance on administrative controls.

  -- Ever increasing maintenance is needed to cope with equipment deterioration due to aging and radiation exposure.

- o DOE estimates that about $920 million is needed to upgrade and replace portions of the F-area separation facility. These funds include upgrades throughout the facility and the eventual replacement of the FB line.

FEED MATERIALS PRODUCTION CENTER (FMPC)

FMPC prepares uranium metal forms for the N-reactor and other DOE weapons program activities. Operations at FMPC consist of various chemical and metal processes. According to DOE officials, operations at FMPC have recently been cut back with the shutdown of the N-reactor. Certain operations at FMPC, such as the chemical processes are rated "marginal."

- o Old or obsolete equipment exists throughout the facility. It is difficult to repair or buy replacement parts.
- o Extensive or frequent maintenance is needed on key operations at the facility. The site utility system will need to be upgraded.
- o Chemical operations do not meet environmental regulations and standards. Current capacity is constrained by nitrate emissions.
- o It is not possible to maintain all seals, packing glands, flanges, and piping to meet health standards. Parts of the FMPC operation should be robotized to avoid human contact with material.
- o Upgrades needed for FMPC could range from $450 million to over $600 million depending on FMPC's future role.

Y-12 PLANT

- o The Y-12 Plant is a diverse production facility specializing in highly sophisticated engineering, development, and manufacturing of nuclear weapons components. The plant provides materials for placement in production reactors and is a major producer of components for nuclear weapons from highly enriched and depleted uranium, steel, and lithium material. Some aspects of the plant were built in the 1940s. Many aspects of the plant are rated by DOE as below "industry average" or "marginal."
- o Many aspects of the facility are aging.
  - -- Equipment in some areas is obsolete and is subject to both operating and maintenance problems. For example, aspects of the utility system for the plant are obsolete and subject to high maintenance.

-- Many of the structures were built in the 1940s and, accordingly, wiring and plumbing do not meet current standards.

o Some aspects of the facility need health, safety, and environmental upgrades.

-- Some equipment, because of its deteriorated condition is a source of continual or potential contamination. In at least one area, respirators need to be worn to prevent possible contamination.

-- Upgrading exhaust systems, filters, and scrubber systems are needed to reduce emissions of acid fumes and other hazardous and/or radioactive material.

-- A production waste treatment facility for hazardous and radioactive waste is needed to treat hazardous waste and encapsulate radioactive waste.

o Upgrades needed at the Y-12 Plant may exceed $1 billion.

SECTION 3

ENVIRONMENTAL RESTORATION

DOE faces great challenges in the area of environmental restoration. Current estimates to correct problem areas range from about $35 billion to over $65 billion. We believe three problem areas warrant detailed discussion.

First, groundwater contamination exists at most of the nuclear defense complex locations. At some locations, contamination has migrated to water resources located beyond plant boundaries. Another important problem area is over a thousand inactive hazardous and radioactive waste sites that may need to be cleaned up because they are releasing or can release radioactive or other contaminants into the environment. Finally, there are deficiencies in environmental monitoring at many DOE installations which could lead to undetected contamination.

GROUNDWATER CONTAMINATION

- Groundwater at FMPC, Hanford Reservation, Lawrence Livermore Laboratory, Los Alamos National Laboratory, Mound Plant, the Nevada Test Site, the Pinellas Plant, Rocky Flats Plant, Sandia Laboratory, the Savannah River Plant, and the Y-12 Plant has become contaminated with radioactive material at levels greater than drinking water standards.

- At some sites such as Hanford Reservation, the Nevada Test Site, the Savannah River Plant, and the Y-12 Plant, the levels for radioactive contaminants are hundreds or even thousands of times above drinking water standards.

- Groundwater at FMPC, Hanford Reservation, Idaho National Engineering Laboratory, Kansas City Plant, Lawrence Livermore Laboratory, Nevada Test Site, Rocky Flats Plant, Sandia Laboratory, the Savannah River Plant, and the Y-12 Plant has become contaminated with hazardous material (solvents, mercury, lead, etc.) above drinking water standards.

- At some sites, such as FMPC, Idaho National Engineering Laboratory, the Kansas City Plant, Lawrence Livermore Laboratory, Rocky Flats Plant, the Savannah River Plant, and the Y-12 Plant, the levels for hazardous contaminants are a hundred or even thousands of times above drinking water standards.

CONTAMINATION HAS MIGRATED OFF-SITE AND IN SOME CASES CAN THREATEN DRINKING WATER SUPPLIES

- o Several off-site wells near FMPC have become unsuitable for drinking water use due to uranium contamination.
- o Groundwater contaminated with radioactive material in excess of drinking water standards is migrating from Hanford into the Columbia River at the plant boundary.
- o Groundwater at Lawrence Livermore Laboratory has become contaminated with solvents greatly in excess of drinking water standards. The contamination has migrated off-site and residential wells have been closed.
- o Tritium contamination at the Mound Plant migrated off-site and contaminated a number of private wells in excess of drinking water standards. Remedial action, however, has reduced levels to within the standards for the wells, but at least one off-site surface spring has levels about five times above the drinking water standard.

INACTIVE WASTE SITES

- o Most nuclear defense complex installations have inactive waste sites of one type or another. These include petroleum, chemical, and radioactive waste spills as well as locations used to dispose of the radioactive and non-radioactive wastes into the ground. These sites can lead to environmental problems when, for example, contaminants migrate into surrounding soil, surface or groundwater, or are suspended in the air by wind or industrial activity and are deposited elsewhere.
- o Some installations have significant inactive waste site problems.
  - -- Hanford has by far the largest number of inactive waste sites--about 1,000. Over the years, liquid waste containing hazardous, radioactive, or other waste was frequently discharged directly into the ground, causing groundwater contamination. There is a high potential for continued groundwater contamination from various waste sites, including two high-level radioactive sites.
  - -- INEL has at least 232 inactive waste sites. In the past, low-level radioactive liquid waste and chemicals were discharged into ponds, wells, or directly into the Snake River Plain aquifer, which flows under the site. Further, solid radioactive and chemical wastes have been disposed in burial grounds,

sometimes in direct contact with the soil, thus providing additional potential for the spread of contamination.

-- There are about 100 inactive waste sites at the Rocky Flats Plant. At least 10 of these sites are considered to be existing or possible sources for significant environmental contamination. Groundwater has been contaminated, and plutonium has contaminated surface soils.

-- There are about 70 inactive waste sites at Savannah River. In its 30 years of operation, the plant has generated large quantities of hazardous, radioactive, and other wastes which have been disposed of in various ways, including shallow land burial or discharge into seepage basins. This has resulted in ground and surface water contamination.

o Waste sites can spread contamination beyond plant boundaries.

-- Uranium in soils within FMPC boundaries has migrated off-site. Further contamination may occur.

-- Plutonium was found beyond the Rocky Flats Plant boundaries in the 1960s. Sediment in two nearby reservoirs contains low-levels of plutonium.

-- High levels of cesium contamination have been found in sediments of an off-site swamp near the Savannah River Plant. Radiation dose rates in the swamp area would be above the DOE guidelines for an unrestricted area if the swamp were populated.

-- Mercury has migrated off-site to contaminate sediments in two stream beds near the Y-12 Plant.

DEFICIENCIES IN ENVIRONMENTAL MONITORING

o Deficiencies in environmental monitoring have been identified in DOE's environmental surveys at many installations within the nuclear defense complex. In some instances, potential sources of contamination are not monitored or are inadequately monitored. These include inactive waste sites and underground tanks. There are also shortcomings in sampling procedures, which can lead to inconsistent and inaccurate results.

o Potential sources of environmental contamination are not adequately monitored.

-- Many known disposal sites at the Hanford Reservation do not have groundwater-monitoring systems.

-- Several liquid discharge locations at Los Alamos National Laboratory are discharging chemicals that are not monitored and can result in potential contamination of soils and sediments.

-- Not all inactive waste areas at the Pinellas Plant have been studied for groundwater contamination, which means that such contamination could go undetected.

-- Leaks in underground petroleum storage tanks at the Savannah River Plant, Rocky Flats Plant, and the Y-12 Plant could go unreported because of a lack of monitoring.

o Procedural problems exists with environmental monitoring.

-- The Pinellas facility does not test certain sludge residues for contamination, and residues of hazardous substances and/or tritium could be present and disposed of improperly.

-- The groundwater-sampling program at the Savannah River Plant has had deficiencies, including mislabeled sampling sites and poor sampling methods.

-- Lack of formal quality assurance practices and procedures at FMPC, and the Y-12 Plant, means that the validity of analytical data at these facilities may be suspect.

-- Data from 14 ambient air sampling sites at Los Alamos National Laboratory may be questionable because of improper placement of the sites.

SECTION 4

DISPOSAL OF RADIOACTIVE WASTES AND CLEANUP OF CONTAMINATED FACILITIES

Because of the nature of DOE's nuclear defense complex, unique waste and contamination problems must be resolved. These include the disposal of radioactive wastes which have accumulated for many years at DOE defense sites, and the decontamination and decommissioning of nuclear facilities after their useful lives are over. While detailed costs are not available, DOE data indicate the eventual cost could easily exceed $45 billion to safely dispose of radioactive wastes and decontaminate existing facilities.

HIGH-LEVEL RADIOACTIVE WASTE

- High-level radioactive waste is generated when irradiated material from nuclear reactors is reprocessed to recover nuclear material (e.g., plutonium). This waste is highly radioactive, produces heat, and must be stored in special containers and handled with special equipment to protect workers and the public.

- High-level waste is produced and stored at three sites--the Hanford Reservation, Idaho National Engineering Laboratory, and the Savannah River Plant. In total about 370,000 cubic meters is stored as liquid, sludge, slurry, and other forms.

- Special techniques are necessary for disposal of high-level waste because it is highly dangerous and long lived. DOE is building a plant at the Savannah River Plant to convert the stored waste into glass to be placed in canisters for eventual permanent disposal in a geologic repository. DOE has plans to build a similar plant at the Hanford Reservation and has tentative plans to build a plant at Idaho National Engineering Laboratory to process and immobilize high-level waste for geologic disposal.

- The geologic repository is being developed under the civilian radioactive waste management program and is expected to be available to accept defense wastes, for a fee, early next century.

- DOE estimates the cost for high-level waste disposal at about $20 billion over the next 25 years. This includes developing and applying technology needed to end interim storage and achieve permanent disposal of all defense high-level waste. It also includes building waste-processing plants and geologic repository fees. The repository is being developed with money from the commercial nuclear power

industry, and DOE will have to pay to dispose of defense waste.

TRANSURANIC WASTE

- Transuranic waste is material such as discarded tools, rags, machinery, paper, sheet metal, and glass contaminated with man-made radioactive elements having atomic numbers greater than uranium. It contains radioactivity, which can be dangerous if it is inhaled, ingested, or otherwise gets inside the body.

- Since the early 1970s, about 60,000 cubic meters of transuranic waste has been stored in a retrievable manner--much of it is in 55-gallon drums--at six locations: the Hanford Reservation, Idaho National Engineering Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Savannah River Plant, and the Nevada Test Site.

  -- DOE plans to use special facilities to prepare and package this stored waste for transportation to the geological repository--the Waste Isolation Pilot Plant in New Mexico.

  -- DOE estimates the cost for disposal of transuranic waste in retrievable storage and to be generated in the future at $5 billion through the year 2015.

- Prior to the early 1970s, transuranic waste was not retrievably stored but was buried at five locations. DOE estimates there is about 190,000 cubic meters of buried transuranic waste at the five locations and up to 300,000 cubic meters of transuranic contaminated soil. According to a DOE official, the cost estimates for treating and/or disposing of this waste are included under Environmental Restoration.

LOW-LEVEL RADIOACTIVE WASTE

- Although low-level waste contains potentially hazardous quantities of radioactive materials in a wide range of concentrations, most generally decays within a few months or years and usually requires little or no radiation shielding for handling. Although some is generated as liquid, most is in the form of dry solids such as equipment, clothing, etc., and is typically disposed of in shallow land burial.

- DOE facilities produce large quantities of low-level waste which requires disposal. DOE operates six major disposal sites for this purpose--Los Alamos National Laboratory, Oak Ridge National Laboratory, Savannah River Plant, Idaho

National Engineering Laboratory, Hanford Reservation, and the Nevada Test Site.

- o DOE estimates the cost to dispose of low-level waste over the next 25 years at more than $5 billion. This includes processing and burying some of the waste using improved confinement techniques, as well as management and technological support for the program.

DECONTAMINATION AND DECOMMISSIONING

- o Many nuclear defense complex facilities become radioactively contaminated because of the materials they use and generate and require special cleanup at the end of their useful lives to remove or reduce levels of radioactivity.

- o Hundreds of facilities have been deactivated and are now awaiting decontamination and decommissioning (D&D), and many more will be deactivated in coming years as aging facilities reach the end of their useful lives.

- o Facilities available for D&D prior to 1995.

  - -- DOE is developing an inventory of nuclear defense complex facilities which are now awaiting D&D or which will become deactivated and available for D&D by the year 1995.

  - -- This inventory is expected to be completed in the fall of 1988 and includes over 400 facilities.

  - -- This total eventual D&D cost is estimated by DOE to range from $5 billion to $7 billion. (This does not include an estimated $3 billion for enrichment facilities.)

- o Facilities to become available for D&D after 1995.

  - -- Although a complete list of all such facilities is not available, many of today's operating facilities such as separations facilities will be difficult and costly to decontaminate.

  - -- Total cost estimates to D&D facilities which will be deactivated beyond the year 1995 are not available, and will depend on policy decisions such as whether or not to close certain facilities. However, DOE officials told us that preliminary indications are that these additional D&D costs could easily exceed $10 billion.

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United States General Accounting Office

GAO

Report to the Chairman, Committee on Governmental Affairs, U.S. Senate

July 1988

NUCLEAR HEALTH AND SAFETY

Oversight at DOE's Nuclear Facilities Can Be Strengthened

GAO/RCED-88-137

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GAO

United States
General Accounting Office
Washington, D.C. 20548

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Economic Development Division

B-222195

July 8, 1988

The Honorable John Glenn
Chairman, Committee on
Governmental Affairs
United States Senate

Dear Mr. Chairman:

We testified before your Committee on Governmental Affairs in a series of hearings in 1987 on the Department of Energy's (DOE) environment, safety, and health (ES&H) activities at its nuclear defense complex. Our testimonies included one in March which focused on the safety aspects of the reactors at DOE's Savannah River Plant and one in June which addressed legislation you introduced to establish an independent board to oversee the safety of the complex. Subsequent to those hearings, you requested that we continue our Savannah River work. We will provide you a report, in the near future, on that work.

As agreed with your office, this letter addresses several broader ES&H issues that were either addressed during the hearings or came to our attention during our work at Savannah River that affect DOE's other nuclear facilities as well. They include (1) the possibility that the visibility and management attention that safety and health issues currently receive within DOE could be reduced in the future, (2) legislatively mandated independent oversight of DOE's nuclear facilities, and (3) unclear safety standards.

While the Nuclear Regulatory Commission (NRC) regulates and oversees the operations of commercial nuclear reactors, DOE for the most part regulates itself. Therefore, a strong management and oversight program is needed to assure the Congress and the public that DOE's nuclear operations are carried out in a safe and environmentally acceptable manner.

We have recommended strengthening DOE's management and oversight program at both headquarters and at the field offices and instituting outside independent review. At DOE headquarters we recommended elevating the safety and health oversight organization to report to the Under Secretary, and at the field level we recommended that operations office staff involved in safety and health report directly and exclusively

to the newly established headquarters group.[1] In addition, we have called for an independent group outside DOE to oversee the safety and health activities of its nuclear facilities.

Results in Brief

Although DOE has acted to improve its ES&H Program for its nuclear facilities, problems remain which, if unaddressed, may keep the program from functioning effectively. In summary, we found the following:

- The Secretary of Energy created the Office of Assistant Secretary for ES&H in September 1985 to oversee the operations offices and contractors responsible for operating DOE's nuclear defense facilities. However, the health and safety functions of that office are not legislatively mandated. As a result, the current or future Secretary of Energy could relegate these important issues to a level within DOE which may not provide top management attention.
- DOE's newly created Advisory Committee on Nuclear Facility Safety does not meet a number of criteria that we believe are essential for effective and independent oversight. Specifically, the Committee (1) is not structurally distinct and separate from DOE and (2) does not have the authority to require DOE to address its findings and recommendations.
- DOE has not fully determined what commercial safety standards are applicable to its nuclear facilities and therefore cannot demonstrate if they are comparably safe to the commercial facilities. Moreover, without defining these standards, no clear criteria exist for determining what aspects of the facilities need to be upgraded or replaced.

We are making several recommendations to DOE and to the Congress aimed at strengthening oversight of DOE's nuclear facilities. The following sections provide details of our findings and recommendations. Appendix I includes our objectives, scope, and methodology.

[1] As we were finalizing this report, DOE officials told us that the Secretary of Energy had approved a resident inspector program for its nuclear facilities and has already placed two staff at Savannah River Plant and one at Rocky Flats reporting to the office of the Assistant Secretary for ES&H.

Safety and Health Function Should Be Legislatively Established

The Secretary of Energy created the Office of Assistant Secretary for ESAH in September 1985 to oversee the operations offices and contractors responsible for operating DOE's nuclear defense facilities. We believe this responded to our recommendations in 1981[2] and 1983[3] to establish such an organization to upgrade these functions within DOE. However, two of the functions of the Assistant Secretary for ESAH—safety and health—are not legislatively established.

DOE was established by the Department of Energy Organization Act (42 U.S.C. 7101-7375) in August 1977. Section 203 of that act created eight assistant secretaries and designated a number of specific functions such as waste management, energy research and development, and compliance with environmental laws to be the responsibility of an assistant secretary. Safety and health issues were not specifically designated.

Consequently, unless responsibility for the health and safety functions was legislatively assigned to a separate assistant secretary, the Secretary of Energy could choose to relegate it to a level lower than assistant secretary within DOE or combine them with other functions assigned to an assistant secretary. Either has the potential to lessen their importance and both have been the case in the past. For example, we stated in our 1983 report that the nuclear safety function had been elevated from reporting to a division director (two levels below the assistant secretary) to reporting to a deputy assistant secretary (one level below the assistant secretary). In addition, from 1981 to 1984, health and safety were the responsibility of the Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness. That Assistant Secretary was responsible not only for health and safety, but also the naval petroleum and oil shale reserves, the Strategic Petroleum Reserve, and planning for energy emergencies.

DOE's Advisory Committee Does Not Meet GAO Criteria for Independent Oversight

Since 1981, we have highlighted the need for outside, independent reviews of DOE's defense complex. We reiterated that concern in a March 18, 1988, letter to you assessing whether DOE's newly appointed Advisory Committee on Nuclear Facility Safety satisfies our criteria for effective independent oversight. We identified the criteria in our June 16, 1987, testimony before your Committee. They are (1) independence,

[2]Better Oversight Needed for Safety and Health Activities at DOE's Nuclear Facilities (EMD-81-109, Aug. 4, 1981).

[3]DOE's Safety and Health Oversight Program at Nuclear Facilities Could Be Strengthened (RCED-84-50, Nov. 30, 1983).

(2) technical expertise, (3) the ability to perform reviews of DOE facilities as needed, (4) clear authority to require DOE to address the organization's findings and recommendations, and (5) a system to provide public access to the organization's findings and recommendations.

DOE established the 12-member Advisory Committee in response to a recommendation by the National Academy of Sciences that an advisory committee to the Secretary be formed to provide independent safety oversight for DOE's nuclear facilities. However, the Advisory Committee, as described in its charter, does not meet two of our criteria for an effective independent oversight organization: independence and clear authority to require DOE to address the organization's findings and recommendations. In addition, it is unclear whether another criterion—public disclosure—is met.

For an oversight organization to be independent it must be structurally distinct and separate from DOE so that DOE has no influence on the organization's funding, staffing, and setting of safety agendas. Only in this way can conflicts between DOE's programmatic and safety goals be prevented. DOE's new Advisory Committee is not structurally distinct and separate from DOE. The members are appointed by the Secretary of Energy and its activities funded by DOE. While DOE has stated that the Advisory Committee has the freedom to consider any safety issue, any new endeavor must first be coordinated with the Secretary before it can be pursued, thus giving the appearance of secretarial control over issues the Committee can examine.

Besides being independent, any effective oversight organization should have authority to require DOE to address the organization's findings and recommendations. Such accountability is important so that DOE will seriously consider and act on these findings and recommendations. DOE's new Advisory Committee, as spelled out in its charter, is "solely advisory" in its duties. In this regard, the Committee will provide to the Secretary of Energy technical information, advice, and recommendations concerning the safety of DOE's production and utilization facilities. While the Committee can make recommendations, the Secretary is not compelled to act on them or even provide rationale as to why the recommendations will not be implemented.

In addition, it is unclear from the charter of the Advisory Committee whether its nonclassified findings, conclusions, or recommendations would be made available to appropriate congressional committees or the public. We believe such disclosure is necessary to keep the Congress and

public fully informed of the problems DOE faces and the risks of operating the nuclear defense complex. Furthermore, public disclosure would make DOE more accountable for its actions.

Safety Standards Should Be Clearly Defined

DOE's nuclear facilities are not required by law to adhere to standards that have been established for commercial nuclear facilities. However, DOE currently has a policy that its facilities will be at least as safe as comparable commercial nuclear facilities. We found that DOE (1) has not clearly defined this policy nor what commercial nuclear regulations and standards apply to its nuclear facilities and (2) has not assessed its nuclear facilities in a systematic way to ensure they comply with its safety policy. Therefore, DOE cannot determine if its facilities are comparably safe to commercial nuclear facilities.

DOE orders are not complete in defining what commercial regulations and standards should be applied to its nuclear facilities. DOE Orders 5480.6 covering reactors and 5480.5, covering other nuclear facilities, state that these facilities will operate in accordance with standards, guides, and codes which are consistent with those applied to comparable commercial facilities. Further, DOE Order 5480.4 states that DOE should review nationally recognized standards and prescribe those that are applicable to DOE activities. However, DOE has been lax in implementing this requirement.

For example, in March 1987, the Assistant Secretary for ES&H sent a memorandum to the Assistant Secretaries for Defense Programs, Nuclear Energy, and Energy Research listing 21 NRC rules completed since 1981 which were not all listed in DOE Order 5480.4, last updated in 1984. The memorandum requested that these offices, in conjunction with the operations offices and contractor personnel, determine if the rules listed are applicable to their facilities. This was a first step to identify more recent commercial requirements that might be applicable to DOE nuclear facilities. The memorandum stated that other pertinent licensed facility requirements have been issued as policy statements, guides, or in other forms and will be addressed at a later date. According to a DOE official, no decision had been made on how to address industry standards established prior to 1981. The official also said that ES&H is reviewing the responses to the March 1987 memorandum and is still deciding how best to resolve any problems.

The National Academy of Sciences also found that DOE had not clearly specified the levels of safety that must be attained at the production

reactors. The Academy believes this lack of specificity resulted in arbitrary and inconsistent application of commercial standards at Savannah River and Hanford, and in some instances, nonapplication of some standards. The Academy found confusion and disagreement over the basic safety objective for the reactors. It therefore recommended that DOE clarify its safety objective for operating the production reactors to provide a clear foundation on which the implementation of safety can be built.

Clarifying DOE's safety policy or standards is also a critical component in decisions to modernize DOE's nuclear defense complex. DOE is developing a modernization strategy for the nuclear defense complex which will necessitate upgrading old facilities or building new ones. A clearly articulated safety policy and standards would be the basis on which a systematic approach to assessing how each facility measures up to the policy and standards could be developed. DOE has not systematically assessed its facilities in the past.

For example, a detailed comparison to commercial industry criteria is required as part of DOE's safety analysis report as one way to demonstrate safe operation. However, DuPont, DOE's contractor at Savannah River, has not done such a comparison since 1967. In September 1987, DuPont's Program Manager for Reactors told us that DuPont has continually updated the reactors over the years to respond to some changes in the commercial nuclear industry and believed that the reactors were as safe as commercial reactors. However, because clear documentation does not exist, it is difficult to demonstrate what standards the reactors did or did not meet.

In March 1987, DOE issued the results of a review of the extent to which the Savannah River reactors conform to a limited number of commercial nuclear design practices. Of the 55 criteria reviewed, 16, or about 30 percent, were not fully met. For example, the safety computers that activate the backup system to shut down the reactors are not seismicly qualified and the heat exchangers which are part of the reactor coolant process are designed to a less stringent American Society for Mechanical Engineers standard than should have been applied.

DuPont has a program underway which draws from NRC's experience with older commercial nuclear plants. It includes a probabilistic risk assessment, severe accident analysis, and an analysis similar to the NRC's Systematic Evaluation Program for older commercial nuclear plants. NRC initiated the Systematic Evaluation Program in 1977 to

review the designs of older operating nuclear plants to confirm and document the safety relative to current licensing requirements. The Reactor Program Manager told us that when their efforts were complete, DuPont would be in a better position to assess whether the safety of the reactors at Savannah River is comparable to that of NRC's licensed reactors. According to a DOE official, DOE is assessing whether to review other nuclear facilities using this approach.

DOE has begun to reexamine how it addresses the safety of its nuclear facilities. On May 2, 1987, the Deputy Assistant Secretary for Safety, Health and Quality Assurance issued a preliminary draft of DOE's new Safety Objectives policy statement for review by DOE headquarters and operations office personnel. According to the Deputy Assistant Secretary, this is the first step in clarifying DOE's safety policy and putting in place a complete program that will assure a systematic way of ensuring the safety of DOE's nuclear facilities. He expected that this policy, along with a backfit policy, would be in place to begin a 2-year test in January 1989. More detailed DOE orders will follow these policy statements.

The safety policy ultimately adopted may have significant impact on DOE's nuclear defense complex. The Deputy Assistant Secretary told us that since the policy is still evolving, DOE is unable to factor in the effects of that policy on the nuclear defense complex modernization strategy it is to provide to the Congress in December 1988. Thus, he said modernization costs may be understated and positions taken in the strategy could possibly change.

Conclusions

DOE has taken positive steps to improve its oversight of the safety of DOE's nuclear defense facilities. The current Secretary of Energy established the position of Assistant Secretary for ES&H with responsibility for safety and health. However, unless this position is legislatively mandated, a newly appointed secretary could assign the safety and health functions to a lower level official within DOE. This could reduce the visibility and attention given to these important issues by top DOE management, especially when compared with nuclear material production.

DOE has recently established an oversight committee reporting directly to the Secretary of Energy. We continue to support independent oversight of DOE nuclear facilities. However, we believe that the oversight committee, as established, does not meet at least two and possibly three of our criteria for effective independent oversight. In addition, since the

committee is not legislatively established, its continued existence is at the discretion of the Secretary of Energy.

DOE has a policy that its nuclear facilities be comparably safe to commercial nuclear facilities, however, that policy is not clearly defined. DOE orders are incomplete concerning what commercial standards should be applied. In the case of the reactors, this has led to inconsistent application and in some cases, nonapplication of important safety standards. While DOE has drafted a new safety policy and begun to better identify standards that might apply to its facilities, DOE has no formal systematic program for assessing its nuclear facilities to determine the extent to which they meet current commercial standards. In addition, once it is determined that a facility does not meet certain standards, no criteria exist to determine if the facility should be upgraded to meet that standard. This is particularly important as DOE develops its strategy for the future of the defense complex. Without the two components—the safety policy and standards and a systematic assessment program—there will be no clear benchmark from a safety standpoint to determine what needs to be upgraded, the level of the upgrade, and/or what needs to be replaced.

Recommendations to the Congress

We recommend that the Congress

- amend the Department of Energy Organization Act to specifically establish the position of Assistant Secretary for ES&H to institutionalize this key component of DOE's oversight program and
- legislatively establish independent oversight of DOE's nuclear defense facilities which will satisfy our five key criteria.

Recommendation to the Secretary of Energy

We recommend that the Secretary of Energy revise DOE orders to establish meaningful safety standards and implementation policies to guide continued operation of existing facilities and to use as baseline safety criteria for developing its future strategy for the defense complex. This revision should include a formal process to (1) clearly identify the commercial standards, guides, and codes that should be applied to DOE's nuclear facilities and (2) justify when a standard is not met.

As requested, we did not obtain official agency comments on a draft of this report. However, we discussed the contents of this report with agency officials who generally agreed with our findings. Unless you

publicly announce its contents earlier, we do not plan to distribute this report until 30 days from its issuance date. At that time we will send copies to the Secretary of Energy and other interested parties.

This work was performed under the direction of Keith O. Fultz, Senior Associate Director. Other major contributors are listed in appendix II.

Sincerely yours,

J. Dexter Peach

J. Dexter Peach
Assistant Comptroller General

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Abbreviations

DOE	Department of Energy
DuPont	E.I. du Pont de Nemours and Company
ES&H	Environment, Safety, and Health
GAO	General Accounting Office
NRC	Nuclear Regulatory Commission

Appendix I

Objectives, Scope, and Methodology

We testified before the Senate Committee on Governmental Affairs on March 12, 1987, about our concerns at the DOE's Savannah River Plant and DOE's nuclear complex as a whole. In another hearing before that same Committee in June 1987, we laid out five key criteria which we believe would be needed for effective independent oversight. During our work at Savannah River and in preparing for the two hearings, we became concerned about several issues that affected the entire nuclear defense complex. In discussing those issues with Committee staff, in October 1987, they asked us to

- determine if DOE had addressed our earlier recommendations concerning DOE's organizational structure to effectively oversee environmental, safety, and health activities,
- identify DOE's reactor safety policy, and
- determine if DOE's proposed independent oversight committee meets our criteria for effective independent oversight.

To address these issues, we reviewed DOE orders, internal memoranda and reports, the March 1987 Design Review of the Savannah River Production Reactors, and the October 1987 National Academy of Sciences report "Safety Issues at the Defense Production Reactors." In addition, we reviewed pertinent sections of the Department of Energy Organization Act (42 U.S.C. 7101-7385) and discussed them with an attorney from DOE's Office of Legislation and Regulations. We also interviewed DOE officials in the Offices of the Assistant Secretaries for EH&S and Defense Programs. At the field level, we interviewed DOE and contractor officials at DOE's operations office at Savannah River, South Carolina.

In addition, to determine if DOE's proposed advisory committee meets our criteria for effective independent oversight, we reviewed the committee's charter.

We performed our work between October 1987 and June 1988 in accordance with generally accepted government auditing standards.

Appendix II

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Environment, Safety and Health Report for the Department of Energy Defense Complex

by

The United States Department of Energy

July 1, 1988

Funding projections shown in this report are provided as one example of how environment, safety, and health activities could be accomplished. This information was supplied by the individual sites. When additional information is available on specific projects, the projects will then be validated and prioritized Department-wide as well as factored into the overall missions and goals. This may result in different funding profiles than are presented here. The resources exceed funding currently included in the Budget Target for FY 1990-1995 for such activities and consequently DO NOT REPRESENT AN ADMINISTRATION POSITION/PROPOSAL.

ENVIRONMENT, SAFETY AND HEALTH REPORT
for the
DEPARTMENT OF ENERGY DEFENSE COMPLEX

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PREFACE

THE REPORT

This environment, safety, and health (ES&H) report highlights the policy, planning, and program activities that contribute to achieving and maintaining compliance with current ES&H requirements. The report focuses on the Department of Energy (DOE) Defense Programs sites and their efforts to clean up environmental contamination and to assure and maintain compliance with ES&H standards. Each DOE headquarters program office (Defense Programs, Energy Research, Nuclear Energy, Fossil Energy, and Conservation and Renewable Energy being the major offices) is responsible for assuring that sites under their purview meet all Departmental requirements, including ES&H standards. A DOE-wide report will be provided in December 1988.

Due to uncertainties in the nature, scope, and magnitude of clean up and compliance activities, particularly beyond FY 1995, the report provides two scenarios of time and resources needed to meet current requirements. Both scenarios, "Expected" and "High", are unconstrained by resources but reflect the range of interpretations that could be applied to existing environment, safety, and health statutes, regulations, and policies. The "Expected" projection represents each sites independent judgment of what activities and resources are most likely to be required to meet existing requirements. The "Expected" projection is not a minimum requirements case; rather, it represents the most likely requirements given the unique characteristics of each site. The "High" projection represents each sites judgement of what activities and resources could be required to meet more stringent interpretations of those existing requirements that could reasonably be imposed upon the sites.

Each site has unique problems and unique solutions associated with clean up and compliance. The volumes of waste to be addressed can vary significantly among sites, depending on initial site operations and technologies utilized in those operations. In the environmental area, the geographic diversity of each of the seventeen DOE defense complex sites requires individual negotiation with respective Environmental Protection Agency (EPA) regional offices as well as with the responsible State regulatory body. While responsive to broad DOE objectives, each site must establish supporting objectives and strategies necessary to address its unique ES&H relationships.

This report identifies "needs" and as such, will be used to formulate long-range plans. The decision to adopt the activities and resource profiles implicit in this report has not been made. When a decision is made, completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal Budget Process. The total resource projections are only illustrative of the magnitude that could be required to accomplish the clean up and compliance activities within the timeframes noted in the report.

SCOPE

This report encompasses current and projected activities designed to clean up the seventeen DOE defense complex sites and to assure continued compliance with current requirements. The majority of these activities are conducted pursuant to environmental statutory requirements or safety and health requirements resulting from DOE Orders, policy statements, or initiatives responsive to internal and external oversight recommendations.

There are, however, other activities that contribute to attainment of DOE environment, safety, and health objectives which are not included in this report since their primary focus is not clean up or compliance with requirements. These other activities are conducted pursuant to the Department's responsibilities under the Atomic Energy Act and support ongoing national security mission objectives of the Department. They include the high level and low level radioactive waste and transuranic waste management operations associated with the Defense Waste Management Program. At this time, decontamination and decommissioning activities related to inactive facilities are not included in this report. Ongoing studies are addressing the scope of these efforts and estimates will be available in December 1988 and incorporated into later reports.

THE DOE DEFENSE COMPLEX

Today's DOE defense complex reflects the concepts common to an earlier era of industrial expansion, during which the major issues governing the design, siting, and operation of facilities were primarily those of national security, worker and public safety, and resource availability.

The wartime race to build a fission weapon dictated unique criteria for establishing needed facilities within a short period of time. To expedite research, the Manhattan Engineering District initially located its laboratories at university facilities and near key scientists. However, to actually produce and test weapons, large, isolated reservations, such as Los Alamos, New Mexico, were required to preserve secrecy and to protect the public. The generation of needed parts and materials also required locations near adequate water supply and electrical power. Therefore, large reservations, such as the Hanford Site in Washington and the Oak Ridge Site in Tennessee, were chosen.

Immediately after World War II, a continued capability to produce weapons was required. While isolation was still required for safety and security of some aspects of atomic research (notably at the Idaho National Engineering Laboratory), assuring a production capability required ready-access to skilled labor pools. This resulted in acquisition of new and surplus facilities in a variety of locations (those remaining today include the Mound Plant in Ohio; the Sandia National Laboratories in New Mexico and California; and the Kansas City Plant in Missouri).

The Soviet atomic bomb explosion and the victory of the Communist Chinese in 1949 ushered in a period of significant facility expansion. This program included developing a new thermonuclear weapon, and providing large numbers of strategic and tactical nuclear weapons for the Department of Defense. As a result, production facilities needed to be doubled in a very short time.

This expansion required decentralized locations beyond the range of potential attack by Soviet strategic bombers. Multiple research, test, and production facilities were acquired (those remaining today include the Lawrence Livermore National Laboratory in California; the Nevada Test Site; the Savannah River Plant in South Carolina; the Feed Materials Production Center in Ohio; the Pantex Plant in Texas; the Pinellas Plant in Florida; and the Rocky Flats Plant in Colorado). Figure 1 shows the location of the major DOE defense complex sites that remain in operation today.

EVOLVING ES&H REQUIREMENTS AND THE DOE DEFENSE COMPLEX

Other than for radiation effects, there was little understanding of the scope and impact of then-acceptable industrial operations on the environment during the 1940s and into the 1950s. Since that time, environment, safety, and health concerns have been evolving and increasingly stringent requirements have been applied. In the safety and health area, the Department is continuing evaluation of facility safety to assure an acceptable margin of safety. In the environmental area, waste management requirements are now more stringent than in the past. Today's standards require remedial investigation of old waste disposal and spill sites at many DOE defense complex facilities.

Increasing environmental requirements resulting from extensive legislative requirements (see Attachment 1) and additional emphasis on DOE safety and health directives and criteria (see Attachment 2) have been applied to the nuclear weapons complex at a time of considerable budgetary restraint. This poses a major challenge for DOE, the Congress, and the Nation: balancing DOE defense operations with escalating environment, safety, and health requirements.

Figure 1:

DOE Defense Complex; Geographic Locations and Initial Acquisition Dates of Major DOE Defense Sites

SECTION 1

POLICY AND PLANNING ACTIVITIES

DOE ES&H POLICY

It is the policy of the Department of Energy to conduct its operations in a manner that is environmentally safe and sound and that protects the health and safety of the public, and DOE employees and contractors. All activities of the Department and its contractors will consistently reflect the Department's paramount concern for and commitment to this goal. Accordingly, all activities shall comply with the letter as well as the spirit of applicable environmental, safety and health statutes, regulations and standards. In addition, DOE is committed to sound management and procedures in all programs and facilities in order to correct existing problems, to minimize risks, to anticipate and address potential problems before they pose a threat to the quality of the environment or the public welfare, and to reduce exposures to hazardous substances and ionizing radiation resulting from facility operation to as low a level as reasonably achievable.

While responsibility for sound ES&H management is a Departmental goal, these practices will be carried out at management levels and at locations where DOE activities are performed. It is, therefore, DOE policy that contractors will share the Department's commitment. The Department expects its management and operating contractors to conduct their operations in a manner that limits the risks to the environment and protects the health and safety of the public and employees. The Department will actively oversee contractor's activities to assure compliance with this policy.

The ES&H policies, definitions, responsibilities, authorities, and requirements are contained in DOE Orders. Consistent with these Orders, program office line management is responsible for effective performance in its respective programs. This program management responsibility includes confirming that applicable Federal and state policies and requirements are vigorously adhered to in all operations. The DOE field operations offices are responsible for assuring that all activities under their jurisdiction are conducted consistent with sound practices and in accordance with DOE management directives. The DOE operating contractors and subcontractors are responsible for carrying out programs and policies consistent with requirements.

In addition to line management implementation of environment, safety, and health activities by the program office, the Office of the Assistant Secretary for Environment, Safety and Health (ASEH) has an independent oversight responsibility to ensure acceptable performance at the program, project, and contractor levels.

The DOE environment, safety, and health program, therefore, consists of a vertically integrated line management function with active independent oversight. Goals and objectives flow from the Headquarters organizations down the hierarchy where they are translated into specific actions at the

operating level. The goals of this system are to: assure the protection of the environment; assure the health and safety of the public and DOE workers; protect government property; assure compliance with applicable statutory requirements; ensure quality technical performance of the program; and require line management to ensure effective performance.

ES&H PLANNING FOR THE DOE DEFENSE COMPLEX

The ES&H planning process for the DOE defense complex consists of six major steps. In the process, operations are constantly evaluated against requirements, strategies are developed to address deficiencies, corrective actions are identified and implemented to achieve and maintain compliance, and resources and schedules are established.

Step 1 - Establish an ES&H Strategy, Objectives, and Goals

The purpose of an overall ES&H management strategy is to assure that the DOE Environmental Policy Statement, Safety and Health Policy Statement, applicable DOE Orders, and other requirements are effectively implemented in DOE defense complex program planning, direction, and execution. To accomplish this, an ES&H management strategy must provide for development of a coordinated system to manage ES&H activities in DOE defense complex programs and facilities. Effective management requires: 1) integrating ES&H activities into every level of program and project management; 2) institutionalizing the planning and management systems necessary to assure that the required actions are planned, budgeted, tracked and accomplished in a timely and cost-effective manner; and 3) participating with internal and external groups in performing comprehensive and systematic evaluations of DOE defense complex facilities and operations to determine compliance with existing requirements and to identify the improvements and/or corrective actions necessary to attain ES&H objectives.

ES&H management strategy is directed toward accomplishing the following objectives, in the order of their priority, with respect to the operation of DOE defense complex facilities and programs:

1. Protect the health and safety of the public and DOE and contractor personnel from potentially adverse impacts;

2. Comply with applicable Federal, state, and local regulatory requirements and pertinent DOE Orders; and

3. Reduce the potential for radiation or chemical exposure, the generation of waste, the release of environmental pollutants, and other potentially adverse environmental impacts to levels as low as reasonably achievable (ALARA).

To support these objectives, the program activities necessary to bring sites, facilities or processes into compliance with requirements must be identified early in the planning process.

Step 2 - Identify Applicable ES&H Requirements

Applicable ES&H requirements are established in DOE Orders, policy statements, and other applicable rules and regulations. In addition to satisfying applicable statutory and other requirements, it is DOE's policy to reduce identified risks even though such corrective actions are not mandated by specific requirements. To this end, defense program organizations assure that requirements are included in program plans and proposals. Field office organizations are responsible for providing assurance that all requirements are met by their operating contractors. The ASEH organization, in its oversight capacity, develops, establishes and interprets environment, safety, and health requirements.

Step 3 - Evaluate Operations Against ES&H Requirements

Program reviews by the program organizations evaluate the implementation of DOE ES&H requirements by field operations offices. Field operations offices conduct management and functional appraisals of programs, projects, and facilities of subordinate field activities and assure that internal appraisals are performed by the operating contractors. The Advisory Committee on Nuclear Facility Safety (ACNFS) provides information to the Secretary of Energy concerning the safety of the Department's defense complex facilities. The ASEH conducts independent management and functional appraisals of line organization activities and contractor facilities, operations, and performance. The ASEH also conducts the Environmental Survey and Technical Safety Appraisals. In addition to these internal DOE evaluations, external organizations such as the National Academy of Sciences (NAS) and the General Accounting Office (GAO) as well as Federal and state regulatory agencies, such as the Environmental Protection Agency (EPA), conduct specific reviews of various aspects of DOE defense complex operations. In several areas of environmental compliance, appropriate Federal and state regulatory agencies are also actively involved in the evaluation of operations and identification of environmental compliance projects.

Step 4 - Establish Compliance Strategies

The field operations offices and contractor organizations in consultation with the headquarters program organizations, establish compliance strategies at the operating level to satisfy ES&H requirements. Where appropriate, environmental strategies are coordinated with representatives of the appropriate Federal and state regulatory agencies. The ASEH provides advice to the field organizations concerning the formulation of compliance strategies.

Step 5 - Complete Studies and Define ES&H Activities

Following the completion of detailed technical and engineering feasibility studies, cost/benefit assessments, and overall integration analyses, contractor organizations define ES&H activities necessary to implement their

compliance strategies. After evaluating proposed ES&H activities, field operations offices submit their preferred approach to the appropriate headquarters program organizations. The headquarters program offices review the field operations office proposals to assure appropriate identification and implementation of ES&H activities.

Step 6 - Identify Resources and Develop Schedules

Field contractor organizations identify resources and develop schedules necessary to accomplish compliance activities which are forwarded to the appropriate program office. In developing these resources and schedules, prioritized results of appraisals and environmental surveys are taken into consideration. In addition to developing resource and schedule projections beyond the budget year, program offices are responsible for assuring that budget proposals provide adequate ES&H resources and that ASEH recommendations on upgrades are considered in the formulation of budget requests to the Office of Management and Budget (OMB) and Congress. The ASEH provides an independent prioritization of corrective actions and upgrade projects based on various sources including appraisals, environmental surveys, environmental audits, and field and program organization budget requests. Line management is responsible for the timely implementation of all corrective actions.

SECTION 2

RECENT TRENDS AND INITIATIVES

In 1985, based upon a study commissioned by the Department on the status of the ES&H program, a new office was established with functions and resources consolidated under a new Assistant Secretary for Environment, Safety and Health (ASEH). From 1985 to 1988, despite growing Departmental resource constraints, the budget of this independent office grew by 80 percent and its staffing level increased by 62 percent. The Department also issued an Environmental Policy Statement and a Safety and Health Policy Statement, stressing the commitment ensuring safe and environmentally sound operations, and reinforcing the ES&H responsibilities of line managers at all levels of the Department. Revised, strengthened safety orders were issued to increase the oversight role of the ASEH, including delegated facility shutdown authority.

In 1986 DOE initiated a two-part program comprised of Technical Safety Appraisal (TSA) evaluations of all aspects of nuclear facility safety and Environmental Surveys at all DOE sites. As of February 1, 1988, 21 of 52 TSAs had been completed, and 26 of 37 sites had been surveyed under the Environmental Survey effort. Priority was given in both efforts to defense complex facilities which are critical both from the ES&H standpoint and for the Department's national security mission.

Following the Chernobyl accident in April 1986, the Secretary directed a number of special safety reviews. A safety review panel of nationally recognized scientific and technical experts was established to help review Hanford Site's N Reactor; the National Academy of Sciences (NAS) and the National Academy of Engineering were requested to provide an independent assessment of safety and technical issues at the Department's 11 Class A reactors; the Department's ES&H staff conducted a special safety review of graphite fire protection and the confinement system at the N Reactor; a design review of the N Reactor and the Savannah River Plant production reactors was conducted by the ES&H staff; and the scheduled Technical Safety Appraisal at the N Reactor was accelerated.

As a result of these and other reviews, DOE has taken the following actions: safety enhancements were scheduled, and many were expeditiously performed for the N Reactor at the Hanford Site, prior to the decision to place the reactor in cold standby; approximate operating power levels at the Savannah River Plant were reduced by 25 percent and, after consultation with the Academies, reduced by an additional 25 percent; and the Plutonium Uranium Extraction (PUREX) Plant and the Plutonium Finishing Plant at the Hanford Site were temporarily shut down due to deficiencies in criticality safety procedures and quality control.

In 1987, the Department, in conjunction with the Environmental Protection Agency (EPA), adopted a new waste regulation rule that subjects DOE radioactive waste containing chemically hazardous components (mixed waste) to

EPA and state regulation under the Resource Conservation and Recovery Act (RCRA). Prior to the issuance of that regulation it was not clear whether RCRA applied to material regulated pursuant to the Atomic Energy Act. This regulatory initiative reflects the Department's commitment to ensuring full protection for the public health and the environment.

In mid-1987, the Department consolidated all environmental remedial actions at defense complex facilities into an Environmental Restoration Program. It also separated management of environmental remedial actions from on-going facility operations. The Department believes that management of current hazardous waste treatment, storage and disposal operations, as well as other ongoing pollution control activities, are an integral part of overall facility operations but that remedial actions need to be treated separately. The establishment of the Defense Environmental Restoration Program gives the Department the necessary flexibility to address its high priority environmental remediation needs.

In late-1987, the Advisory Committee on Nuclear Facility Safety (ACNFS) was created to provide the Secretary of Energy technical information, advice, and recommendations concerning the safety of the Department's production and utilization facilities. The ACNFS has two primary duties: 1) to review significant safety concerns and provide advice to the Secretary of Energy, and 2) to review and provide advice on specific issues or matters relating to the safety of DOE facilities or operations.

Over time, the Department's industrial occupational safety record significantly exceeds the performance of the private sector. Lost-time accident rates are less than one-third of the national average. Lost workday rates have averaged less than one-half the National Safety Council industry average rates. Radiation exposures at DOE defense complex facilities in general are one-tenth the levels that existed in 1974. Over the last ten years, less than one percent of all workers exposed to radiation at DOE facilities received more than 40 percent of the allowable annual dose for workers, which is one-third the rate at commercial facilities.

The progress resulting from the DOE initiatives taken since 1984 can be measured in terms of accelerated corrective actions and increased resource commitments for ES&H. In the mid-1980s, the Department undertook an effort to enter into environmental compliance agreements with state and Federal regulatory agencies. Since 1984, the number of environmental compliance agreements has grown from three in 1984 to currently more than thirty. Figure 2 depicts the growth of DOE defense site environmental compliance agreements from 1984 through 1989. There are thirty-one compliance agreements between DOE and/or EPA and the states being tracked. There are an additional nine agreements under development expected to be completed by the end of 1989. These additional agreements involve nine defense complex sites which have been identified as candidates for the National Priority List.

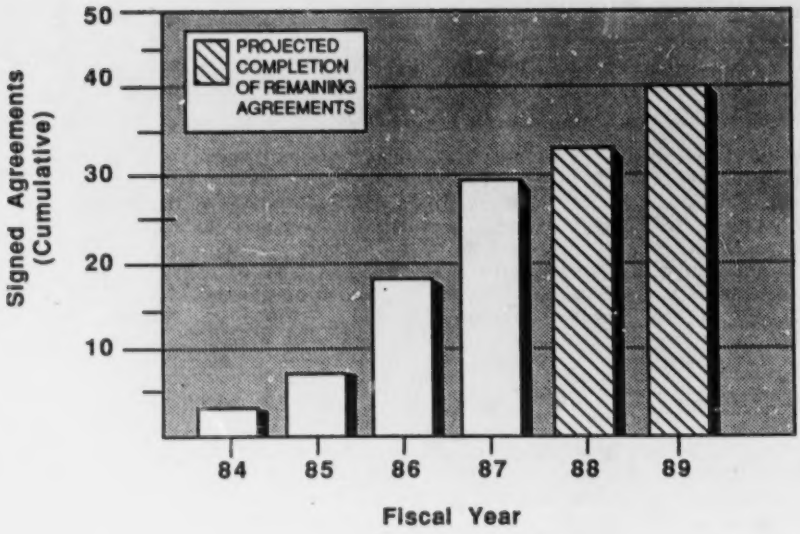

Figure 2:

DOE Defense Complex; Growth of Environmental Compliance Agreements at DOE Defense Facilities

A strong trend is evident in the increase in the ES&H resources in the DOE defense budget from FY 1984 to FY 1989. The DOE defense complex ES&H budget has grown from approximately $350 million in FY 1984 to projections in the President's budget of more than $1 billion in FY 1989. These increases reflect a planned effort to assure compliance at a number of defense complex sites through major line item construction projects as well as increased operating expenditures in the ES&H areas. A large share of the increases are for requirements resulting from both internal and external reviews of DOE defense complex facilities. Major projects include the Environmental Restoration Programs at inactive waste sites, Reactor Effluent Cooling Water Thermal Mitigation at the Savannah River Plant, and the continuation of major ES&H improvements at the Feed Materials Production Center. This trend of increasing DOE defense complex ES&H resource commitments is seen in Figure 3.

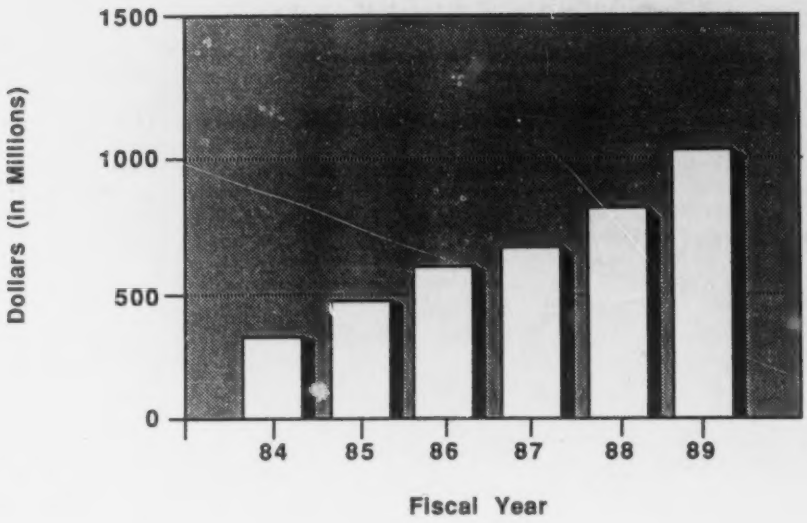

Figure 3:

DOE Defense Complex; ES&H Resources
(FY1988 and FY1989 from FY1989 President's Budget)

SECTION 3

SUMMARY OF CURRENT AND PROJECTED ACTIVITIES

Those initiatives set forth in Section 2 have formed the policy, management, and planning base through which the Department will address the ES&H problems facing the seventeen DOE defense complex sites. Projected actions have been broadly classed into two areas: environment, and safety and health, each consisting of a base program and discrete corrective actions to address known ES&H problems.

At each site, ES&H activities are an integral part of day-to-day operations. This effort includes the activities and personnel required for operation of ES&H-related equipment, monitoring of conditions, administrative controls and reports, environmental impact assessments, operational and facility safety such as fire protection and medical assistance, and other infrastructure required for continuing viable operations at each site. This base program would continue at each site, exclusive of the need for additional clean up or compliance activities.

To address the clean up and compliance of sites to meet ES&H standards requires the identification, planning, and execution of discrete corrective actions. The "Expected" projection represents each site's independent judgment of the most likely efforts required to meet the standards unique to each site under current Federal and state regulations, agreements, and policies. The "High" projection represents each site's independent judgment of what might be required to meet more stringent interpretations of those same standards, agreements, and policies that could encompass a more thorough level of clean up, such as exhumation of material or near-background levels of exposure.

Selection, implementation, and completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal Budget Process.

ENVIRONMENTAL BASE PROGRAM

The environmental base program is a continuing activity that incorporates day-to-day activities related to environmental requirements at each site. The major elements of the environmental base program include: operation of existing pollution control equipment; monitoring of source and ambient conditions; dispersion and pathway modeling; development of administrative controls; evaluation of new emission control and reduction initiatives; process and control technology research; environmental impact assessment activities; and development and reassessment of environmental protection strategies and plans.

ENVIRONMENTAL CORRECTIVE ACTIONS

Discrete corrective actions are necessary to address specific environmental problems applicable to various environmental statutory requirements and to fulfill compliance agreements with state or local regulatory bodies. Four major categories are included: air, water, solid waste management, and remedial action. Most of the seventeen DOE defense complex sites have ongoing environmental corrective actions. Over the next few years, a significant increase in these activities is planned to address the variety of site-specific situations.

Air

Within the range of "Expected" and "High" site-specific uncertainties, corrective actions for Air related media could be fully completed by FY 2010. (See Figure 4.) Under current requirements, the majority of sites project that completion of these corrective actions could occur within 5 years from today, if adequate funds are available. Only 2 sites project to require longer than 10 years to complete these corrective actions, if a higher level of action were necessary.

The DOE atmospheric protection policy is to conduct operations in a manner that protects human health and safety, meets regulatory emission requirements, reduces emissions below regulatory limits, and complies with applicable Federal, state, and local requirements. The basis for the compliance strategy is the regulatory requirements promulgated pursuant to requirements of the Federal Clean Air Act (CAA). Radionuclide emissions must be controlled to meet the policy set forth by DOE Orders which require that all DOE facilities maintain radionuclide emissions at as low as reasonably achievable (ALARA) levels. All DOE defense sites have air monitoring programs to evaluate air quality and the potential impacts of plant operations. Air quality monitoring results are presented in the site annual environmental monitoring reports.

Specific programs are underway to ensure compliance. Each of the DOE defense sites has developed an atmospheric protection program that meets its specific needs. Generally, these programs include the following major program elements: permitting, air quality and impact assessment, emission management, R&D operations, and monitoring.

Examples of typical corrective actions to implement the DOE policy include improvements in: ventilation, stack exhaust, and air filtration systems; air monitoring stations; oxides of nitrogen (NOx) abatement systems; and air modeling activities.

Although the implementation of corrective actions in the atmospheric protection program is site-specific and varies with the type of operating facility, (e.g., NOx abatement due to processing of calcined waste at the Idaho National Engineering Laboratory, and hydrofluoric acid emissions control at the Y-12 Plant), many of the sites have generic atmospheric protection problems. For example, because of the age of the facilities, many

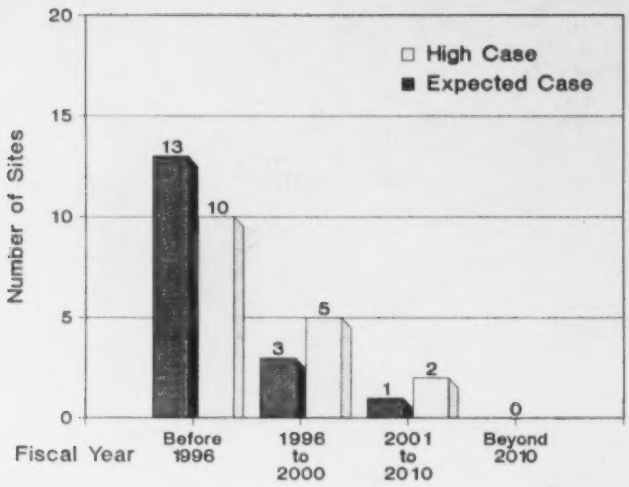

Figure 4:

DOE Defense Complex; Number of Sites Completing Environmental Air Corrective Actions

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of the ventilation, exhaust, and air filtering systems need improvement. Such major improvements are planned at the Feed Materials Production Center, the Y-12 Plant, the Los Alamos National Laboratory, and the Hanford Site, among others. Another atmospheric protection corrective action that is generic in nature is an increased effort in air monitoring at many of the sites. Examples of major upgrades in this area are planned at many of the Rocky Flats Plant, the Y-12 Plant, and the Los Alamos National Laboratory.

Water

All sites project completion of these corrective actions addressing current requirements within the next 20 years. (See Figure 5.) Under current requirements, the majority of sites project completion of these corrective actions within the next 5 years, under either the "Expected" or "High" projections, if adequate funds are available.

Compliance with applicable regulations, DOE Orders, and operational management policies forms the basis for the DOE water pollution control policy. The compliance activities are regulated primarily by the requirements of the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), and the Resource Conservation and Recovery Act (RCRA).

The objective of DOE water pollution control programs is to manage all waste streams to ensure that liquid effluents meet or exceed all regulatory requirements. Generally, the strategy for reaching this objective includes the following major program elements: identifying regulatory and other protection requirements, promoting innovative and cost-effective means of meeting requirements through research and development, conserving water, and evaluating the controls to ensure that protection requirements are met.

Examples of typical corrective actions to implement the DOE water pollution control policy are: construction of radioactive waste treatment facilities; upgrading, consolidating, and constructing sanitary wastewater treatment facilities; construction of biological waste water treatment facilities; upgrading of drinking water supplies; and groundwater investigations.

A number of facilities are working to meet the conditions of the National Pollutant Discharge Elimination System (NPDES) and there are ongoing and planned projects to comply with the NPDES permit and other requirements. For example, the Feed Materials Production Center is planning to install a biodenitrification plant to meet state standards for nitrate discharge, the Savannah River Plant is planning for a recirculating cooling tower to mitigate hot water discharges from K Reactor, and the Rocky Flats Plant is reducing wastewater volume and upgrading the quality of discharges. Other projects that are required to either attain or maintain compliance with NPDES permits are at the Kansas City Plant, to eliminate polychlorinated biphenyls (PCBs) from industrial and sewage discharge, and at the Los Alamos National Laboratory, for sanitary waste water consolidation. Because many of the drinking water systems in the DOE defense complex are 30 to 50 years old, some upgrading is needed and this is reflected in the site ES&H plans. For example, drinking water systems are being upgraded at the Mound Plant and at the Idaho National Engineering Laboratory.

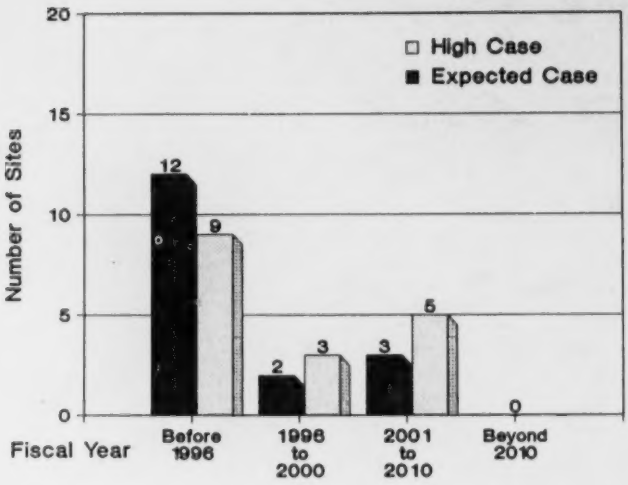

Figure 5:

DOE Defense Complex; Number of Sites Completing Environmental Water Corrective Actions

Solid Waste Management

Most sites project completion of these actions to address current requirements within the next 5 years, given the bounds of the "Expected" and "High" projections and the availability of funds. (See Figure 6.) However, due to the scope of efforts, some sites project more than 20 years to complete these corrective actions, if more stringent interpretations of current requirements are implemented.

The solid waste management category is comprised of the treatment, storage, and disposal of non-hazardous, hazardous, and radioactive mixed wastes. Programs for the management of these wastes are included in DOE Orders and address requirements of the Resource Conservation and Recovery Act (RCRA), the Hazardous Solid Waste Amendments (HSWA), the Toxic Substances Control Act (TSCA), and applicable state regulations. In order to assure compliance with all present and future solid waste management regulations, the DOE defense complex facilities have developed programs characterized by two phases. The initial phase involves the implementation of a comprehensive program to identify deficiencies and to develop a management system to resolve these deficiencies. Major elements of this initial phase are site monitoring and environmental audits which identify key areas of focus for corrective actions. The second phase addresses the long-term goals of process optimization, pollutant source elimination, waste reduction and tracking, and hazardous material substitution which embodies the approach of the conservation of resources espoused in the RCRA.

Areas of activity focus in solid waste management across the DOE defense complex include attaining compliance with RCRA, management of radioactive mixed wastes, and management of toxic substances, such as PCBs under the TSCA. Near-term strategies developed at each site incorporate the following elements: assessment of existing disposal facilities; permitting for operation and closure of existing disposal facilities; development of administrative procedures for tracking and assay of waste streams; development of intermediate storage and ultimate disposal systems for hazardous and mixed wastes; development of compaction, incineration, and solidification facilities for volume reduction and stabilization of hazardous and mixed wastes; and removal and disposal of PCBs used in electrical and non-electrical transfer equipment.

Strategies implemented at a particular site vary with the magnitude of the problem, physical resources available at the sites, and the land use or demographic conditions specific to the site. For example, planned management of PCBs at larger sites, such as the Savannah River Plant, the Hanford Site, and the Y-12 Plant, involve on-site tracking, storage, incineration and disposal; while at smaller sites, such as the Kansas City Plant, the Mound Plant, and the Pinellas Plant, management of PCBs involves on-site tracking and storage with off-site disposal. Long-term strategies incorporate process modification and waste minimization, as in the construction of a new high explosive processing facility at the Pantex Plant or the reassessment of head end processing at the Idaho Chemical Processing Plant. Details of site-specific strategies developed for management of each class of solid wastes are described in the site ES&H plans.

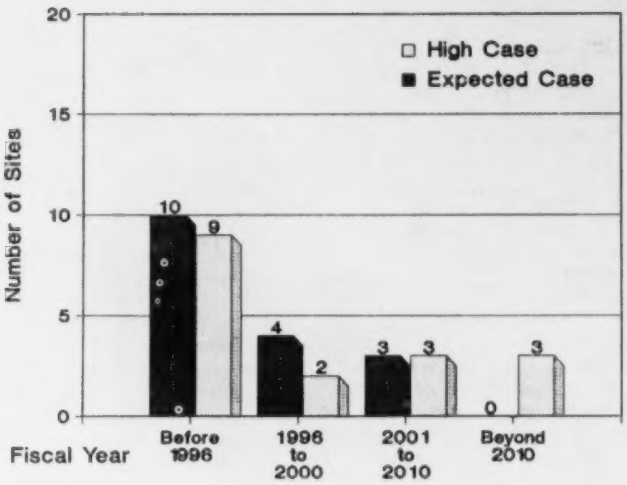

Figure 6:

DOE Defense Complex; Number of Sites Completing Environmental Solid Waste Management Corrective Actions

Remedial Action

Due to the scope and complexity of the problems, Remedial Action corrective actions are projected to extend significantly longer than other environmental corrective actions at most sites. (See Figure 7.) These efforts to clean up contaminated sites, which are currently in the assessment stages, will be conducted in accordance with CERCLA requirements. If adequate funds are available, these actions could be completed within 10 to 20 years at the majority of sites, within the range of the "Expected" and "High" projections. Some sites project more than 20 years to complete these actions, especially at the "High" projection, due to the scope of the effort that could be required if extensive site characterization, exhumation of material, or extended aquifer clean up were required to meet current requirements.

The requirements for the identification, assessment, investigation, and remediation of past and present disposal sites and areas of environmental contamination are set forth under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act (SARA), and RCRA 3004(u). The DOE defense complex facilities are responding to these requirements under the Environmental Restoration Program. The five-phase effort of site identification/ assessment, contamination confirmation, remedial action selection, remedial action implementation, and post-action monitoring is set forth in DOE Orders.

In addition to these facility efforts, DOE Headquarters is conducting an independent Environmental Survey to identify areas of existing or potential environmental contamination that may require further investigation or remediation. DOE facilities must respond to applicable state regulatory requirements for groundwater protection, underground storage tanks, and remediation of contamination resulting from past or present waste management activities.

Each of the DOE defense sites has a program underway to meet the remedial action requirements under RCRA, CERCLA, and state regulatory programs. The sites are in the process of addressing the restoration of waste repositories and of environmental contamination areas to mitigate existing or potential soil and/or groundwater contamination and to eliminate future contamination sources. This involves the clean up and protection of groundwater and soil from waste disposal practices, spills, and leakage from underground storage tanks. Supporting these activities are the identification and prioritization of sites, investigations into the nature and extent of contamination, and investigations to better understand subsurface conditions, migration pathways, and aquifer systems.

In addition, the Department recently reached agreement with the Environmental Protection Agency on model provisions for Federal Facility Agreements to be negotiated under the Comprehensive Environmental Response, Compensation and Liability Act.

Remedial actions to correct environmental contamination are proceeding under the Environmental Restoration Program. Site identification, preliminary assessment, and hazard ranking activities have been completed for all DOE

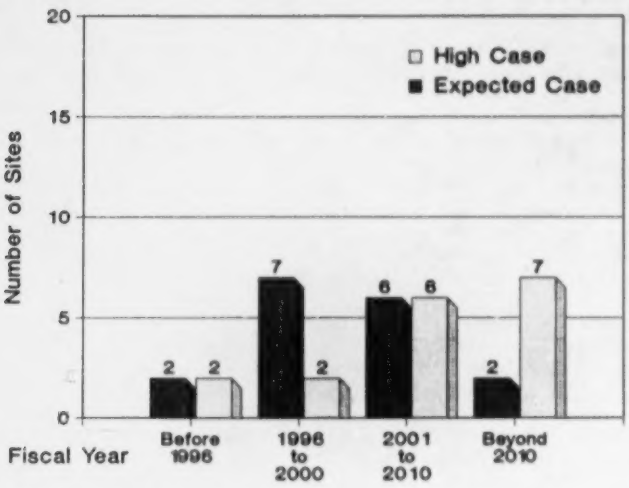

Figure 7:

DOE Defense Complex; Number of Sites Completing Environmental Remedial Action Corrective Actions

defense complex facilities and have been submitted to EPA in compliance with the April 1988 SARA deadline. Investigation and feasibility study activities are in the planning process at all defense complex locations and a few are already underway. In several cases, remedial action activities are underway to clean up groundwater (such as extraction and air stripping at the Lawrence Livermore National Laboratory, and at the Savannah River Plant), and to remove contaminated soils (for example, at the Kansas City Plant, the Pinellas Plant, and at the Mound Plant). A major activity at the Hanford site is stabilizing soil over waste sites by cleaning up contaminated soil and revegetating with shallow rooted plants. Remedial actions for many DOE land disposal sites will involve site closure and post-closure care. The development of these plans for submittal to appropriate regulatory agencies is in the planning process at defense complex facilities.

Programs to identify, test, certify, replace, and clean up leakage from underground storage tanks have been implemented at all facilities. Completion status varies by facility and is described in the individual site plans.

A few sites have in place or are negotiating state and/or Federal Consent Orders and Compliance Agreements regarding soil and groundwater contamination at RCRA 3004(u) areas. These orders establish schedules to be followed by the sites for the completion of assessments, remedial investigations, feasibility studies, or closure plans in addition to the initiation of corrective actions.

Once remedial actions are completed, long-term, post-action monitoring will be conducted under the base environmental program.

EXAMPLES OF ENVIRONMENTAL PROJECTS

The following are examples of major defense complex environmental projects greater than $20 million which are representative of the four areas of environmental reporting previously discussed. These examples include projects that would be funded by line-item construction, operating, and general plant project budget categories.

- Environmental Restoration Program, Los Alamos National Laboratory ($1400 million)
- Environmental Restoration, Hanford Plant ($650 million)
- Subsurface Migration at RWMC (Buried Waste Program), Idaho National Engineering Laboratory ($500 million)
- RCRA Compliance, Hanford Plant ($371 million)
- Comprehensive Environmental Restoration Program, Rocky Flats Plant ($345 million)
- Alternatives to Soil Column Disposal, Hanford Plant ($112 million)
- Separations Area Seepage Basin Closure, Savannah River Plant ($70 million)
- RCRA/CERCLA Remedial Actions, Idaho National Engineering Laboratory ($65 million)
- On-Site Groundwater and Soil Investigations, Lawrence Livermore National Laboratory ($59 million)

- Separations Area Effluent Treatment Facility, Savannah River Plant ($50 million)
- Consolidated Incinerator, Savannah River Plant ($47 million)
- Elimination of PCBs, Kansas City Plant ($45 million)
- Decontamination/Waste Treatment Facility, Lawrence Livermore National Laboratory ($41 million)
- Waste Pit and Silo Remediation, Feed Materials Production Center ($40 million)
- Replace/Upgrade Dust Collection System, Feed Materials Production Center ($38 million)
- NOx Abatement, Idaho National Engineering Laboratory ($35 million)
- Plant 1 Control Pad and Shelter, Feed Materials Production Center ($30 million)
- Environmental, Health and Safety Phase I-III, Mound Plant ($30 million)
- Off-Site Groundwater Investigation, Lawrence Livermore National Laboratory ($26 million)
- Environmental Hazards Elimination, Kansas City Plant ($25 million)
- Comprehensive Environmental Restoration Program, Pinellas Plant ($25 million)
- Hazardous/Mixed Waste Disposal Facility, Savannah River Plant ($22 million)
- Reactor Electrical Distribution System, Savannah River Plant ($21 million)

SAFETY AND HEALTH BASE PROGRAM

As with the environmental base program, similar day-to-day efforts must be maintained to assure continuing safety and health compliance activities. Operations of DOE facilities require focus in seven key areas under the safety and health umbrella.

Nuclear Safety

The DOE safety and health orders establish nuclear safety requirements to ensure that the safety of each DOE-owned nuclear facility is properly analyzed, evaluated, and approved. The orders also ensure that nuclear facilities are sited, designed, constructed, modified, operated, maintained and decommissioned in a manner that gives adequate protection for health and safety and will be in accordance with uniform standards, guides, and codes which are consistent with those applied to comparable licensed nuclear facilities.

Selected improvements to the nuclear facilities safety base programs contained in the site ES&H plans include: enhancing safety analyses; improving technical specifications; increasing training and qualifications; improving quality assurance methods; expanding independent review and appraisal; and updating safety documentation.

Industrial Safety

The individual site ES&H plans, by meeting the requirements of the DOE industrial safety orders, ensure a safe work place. The base program is undergoing a number of improvements to enhance capabilities in accident analysis and prevention. Examples of industrial safety activities include: repairing and improving facilities; increasing worker and supervisor training; increasing attention to construction and contractor training; improving data collection and accident analysis; and enhancing safety at explosive facilities.

Fire Protection

A fire prevention and protection program is required by DOE Orders to ensure that: no threat to the public health or welfare will result from fire; no undue hazards exist to employees from fire; vital DOE programs do not suffer unacceptable delays as a result of fire; and property damage from fires can be held to acceptable levels.

Planned programs at the DOE defense complex facilities will modernize the fire protection and life safety systems to achieve state-of-the-art fire safety practices. Larger fire stations and added equipment are planned at DOE sites to meet growing fire protection needs.

The fire protection base programs outlined in the site ES&H plans involve many techniques to maintain and improve fire safety, including: maintaining fire protection water supplies; maintaining fire alarm systems; and maintaining fire protection systems and installations.

Radiation Protection

The radiation protection sections of the site ES&H plans comply with applicable DOE Orders. The following items summarize some of the base program improvements contained in the site ES&H plans: contamination control and confinement; internal dosimetry models and dose calculation techniques; radiation worker training (including training of a larger fraction of the workforce); records systems (including automated data retrieval systems); instrument maintenance, calibration, and testing; written procedures and documentation; ALARA program; and replacement of tritium control and monitoring equipment.

Industrial Hygiene

The base programs described in the site ES&H plans specifically address the increased resources needed for industrial hygiene improvements. Selected industrial hygiene improvements are: increasing characterization of the work place; maintaining exposure histories of workers; upgrading analytical facilities and equipment; completing full implementation of the Carcinogen

Control Program; completing full implementation of a Hazards Communication Program; completing full implementation of respiratory protection programs; upgrading ventilation systems; instituting more broadly based hearing conservation programs; improving documentation and internal review systems; increasing illumination; and enhancing filter testing to assure containment of toxic and radioactive contaminants.

Occupational Medicine

The occupational medicine section of the site ES&H plans reflect adherence to the requirements as provided in the DOE Orders and acknowledge the importance of the promotion of good health. Selected topics that summarize improvements to the base programs are: greater attention to job-specific physical examination requirements; site-awareness training for physicians and nurses; improvements in data tracking systems; enhancements in physical therapy and rehabilitation to meet the growing number of musculoskeletal disorders; and expansion of counseling in diverse health-related areas.

Emergency Preparedness

DOE orders prescribe the required emergency management systems, emergency planning, preparedness, and response capabilities for all DOE operations. The ES&H plans recognize these requirements as the basis for their programs.

Following are some of the improvements planned in the base programs to ensure that DOE facilities are in a state of readiness to handle potential emergencies: maintenance of emergency operating plans; improvements in on-site communications capabilities, such as more extensive public address systems and use of new telecommunications equipment; and employment of computer-based personnel accounting systems.

SAFETY AND HEALTH CORRECTIVE ACTIONS

Discrete corrective actions are necessary to conform to safety and health requirements derived from DOE Orders, policy statements, and from internal and external oversight recommendations. Due to the multiplicity of safety and health activities required at each site, the categories of interest in this area are those corrective action activities focused on facilities generally classed as Nuclear Reactor, Non-Reactor Nuclear, and Non-Nuclear.

Nuclear Reactor Facilities

The majority of sites project completion of safety and health corrective actions at Nuclear Reactor facilities within the next 5 to 10 years, within the range of "Expected" and "High" actions to meet current requirements, and if funds are available. However, two sites could require longer than 10 years to complete these compliance activities, if a higher level of action is necessary. (See Figure 8.)

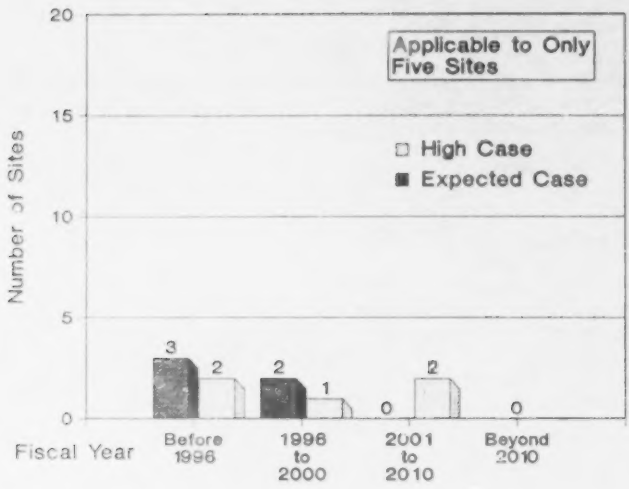

Figure 8:

DOE Defense Complex; Number of Sites Completing Safety and Health Nuclear Reactor Facility Corrective Actions

A wide range of corrective actions for reactor facilities are identified in the site ES&H plans. For example, an aggressive program to improve reactor safety has been initiated for the Savannah River Plant reactors. The Savannah River Plant plan includes tasks to demonstrate adequate reactor cooling via the Emergency Cooling System Functional Review. This assessment is based on the Safety System Function Inspection program being used by the Nuclear Regulatory Commission (NRC) for commercial nuclear power plants. Other major ongoing or planned safety enhancement activities for the Savannah River Plant reactors include: a broad-based safety management assessment; implementation of an integrated work/resource management system; use of probabilistic risk assessments; DOE order/NRC regulation comparability studies; fire system upgrade/fire hazards safety upgrades; remote monitoring and control system improvements; reactor emergency cooling system upgrades; reactor training by simulator; improvements in reactor confinement; an integrated systematic evaluation program; and facility modernization.

Improvements at Hanford's N Reactor include substantial completion of a Safety Enhancement Program (SEP). This program is intended to reduce the probability of accidents, and to improve mitigation should an accident occur. Some of the major SEP items include: a graphite growth study; pressure tube integrity analysis (destructive and non-destructive studies); hydrogen mitigation modifications; confinement testing; surveillance/monitoring improvements; improvements in reactor instrumentation and controls; liquid waste discharge analysis; and emergency core cooling upgrades. A decision has been made recently to place N Reactor in cold standby. Those work activities that would have been completed prior to the scheduled 1988 startup will be completed before cold standby. Other work activities will be brought to an orderly conclusion and properly documented. It is planned to achieve cold standby status by the end of FY 1989.

Non-Reactor Nuclear Facilities

In Non-Reactor Nuclear facilities, the majority of sites project to complete these compliance actions to meet current requirements within 5 to 10 years, if adequate funds are available. (See Figure 9.) A few sites project to require more than 10 years to complete either "Expected" or "High" compliance actions.

A wide range of corrective actions are planned for non-reactor nuclear facilities. Examples include: construction of health physics calibration facilities to meet new DOE Orders at the Oak Ridge Y-12 Plant, the Pantex Plant, the Los Alamos National Laboratory, the Pinellas Plant and the Mound Plant; upgrading in-vivo monitoring systems at the Rocky Flats Plant, the Idaho National Engineering Laboratory and the Savannah River Plant; acquisition and installation of new continuous air monitors at the Idaho National Engineering Laboratory, the Los Alamos National Laboratory, the Hanford Site, and the Savannah River Plant; general facility modifications to reduce occupational hazards (e.g., stairwell modifications, materials handling equipment replacement, etc.) at such sites as the Los Alamos National Laboratory, the Savannah River Plant, the Feed Materials Production Center; upgrades in ventilation systems for enhanced radiation control at

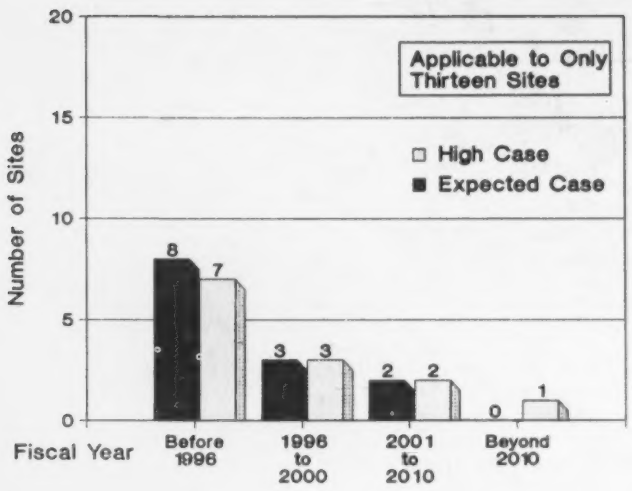

Figure 9:

DOE Defense Complex; Number of Sites Completing Safety and Health Non-Reactor Nuclear Facility Corrective Actions

various facilities; structural upgrades and increased neutron shielding of plutonium facilities at the Rocky Flats Plant, Los Alamos National Laboratory, and the Sandia National Laboratories/Livermore; and upgrades of tritium facilities at the Lawrence Livermore National Laboratory and at the Los Alamos National Laboratory.

Non-Nuclear Facilities

For Non-Nuclear facilities, the majority of sites project to complete these compliance actions within 5 years, if adequate funds are available. All but one site project completion of the necessary actions within the "Expected" and "High" range, within 20 years. (See Figure 10.)

A range of corrective actions are planned for non-nuclear facilities in the defense complex. Examples are: new occupational medical facilities at the Nevada Test Site and the Idaho National Engineering Laboratory; asbestos abatement programs at the Pinellas Plant, the Los Alamos National Laboratory, the Kansas City Plant, the Savannah River Plant, the Mound Plant and other facilities; new facilities for analytical chemistry at the Los Alamos National Laboratory, the Pantex Plant, and the Savannah River Plant; upgrades of emergency operating centers; replacement of the plant evacuation notification system at the Kansas City Plant and the alarm system at the Pantex Plant; fire system upgrades and expansion at various facilities, including the Pinellas Plant, the Pantex Plant, the Kansas City Plant, the Idaho National Engineering Laboratory, the Savannah River Plant, the Sandia National Laboratories, and the Nevada Test Site; and new fire stations at the Savannah River Site, the Hanford Site, the Pantex Plant, and the Pinellas Plant.

EXAMPLES OF SAFETY AND HEALTH PROJECTS

The following are examples of major defense complex safety and health projects greater than $5 million which are representative of the three areas of safety and health reporting previously discussed. These examples include projects that would be funded by line-item construction, operating, and general plant project budget categories. The following safety and health projects are expressed in millions of dollars.

- Plantwide Fire Protection, Phase II, Savannah River Plant ($120 million)
- Plantwide Fire Protection, Phase I, Savannah River Plant ($80 million)
- General Plant Ventilation Upgrade, Feed Materials Production Center ($55 million)
- Asbestos Management Program, Los Alamos National Laboratory ($52 million)
- Improved Reactor Spray System, Second Area, Savannah River Plant ($50 million)
- Improved Reactor Spray System, First Area, Savannah River Plant ($43 million)

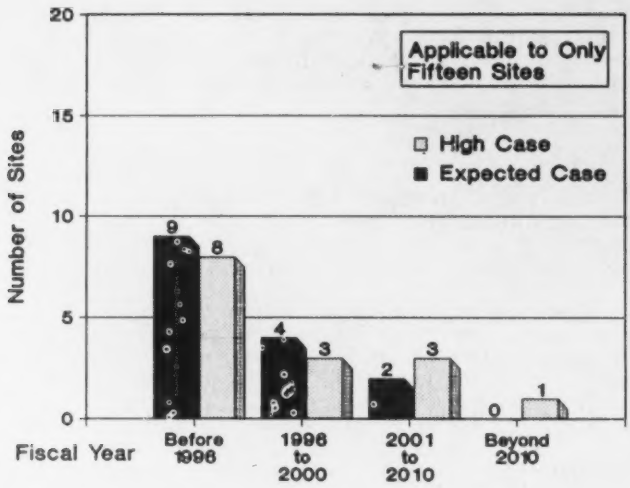

Figure 10:

DOE Defense Complex; Number of Sites Completing Safety and Health Non-Nuclear Facility Corrective Actions

- Facility Safety Upgrade, Hanford Plant ($43 million)
- Reactor Operations Monitoring System, Savannah River Plant ($42 million)
- Relocate Non-Explosives Operations, Los Alamos National Laboratory ($42 million)
- Extend Reactor Area Diesel Engine Operations, Savannah River Plant ($37 million)
- Materials Handling Improvements, Feed Materials Production Center ($22 million)
- Fire Protection Upgrades, Kansas City Plant ($15 million)
- Safety Related Code Deficiencies, Y-12 Plant ($14 million)
- Fire Protection Upgrades, Pantex Plant ($7 million)
- Seismic Safety Upgrade, Lawrence Livermore National Laboratory ($7 million)
- Emergency Operations Center/Central Fire Stations, Pantex Plant ($7 million)
- Fire Protection Upgrades, Savannah River Plant ($5 million)
- Criticality Alarm Display and Storage, Rocky Flats Plant ($5 million)

SECTION 4

SUMMARY OF RESOURCE PROJECTIONS

The activities discussed in Section 3 will require a significant investment of resources to complete the clean up and to assure compliance with ES&H requirements at the seventeen DOE defense complex sites. All resource projections are expressed in constant FY 1990 dollars to facilitate trend comparison.

This report identifies "needs" and as such, will be used to formulate long-range plans. The decision to adopt the activities and resource profiles implicit in this report has not been made. When a decision is made, completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal budget process. The total resource projections are only illustrative of the magnitude that could be required to accomplish the clean up and compliance activities within the time frames noted in the report.

Table 1 summarizes the Funding Projections from FY 1988 through FY 1995 for the seventeen DOE defense complex sites. The data are based on the most comprehensive information available, incorporating all known and potential ES&H actions. Site specific data are available in the appropriate Appendix to this report. For environment, safety and health base program activities, a cumulative of over $5 billion is projected to be required to carry on these activities through FY 1995. Thereafter, these activities are expected to average nearly $700 million per year.

For Environmental Corrective Actions, nearly $6 billion would be required through FY 1995 to address the necessary actions in the time frames implied in Section 3 and the site appendices. As reflected in Figure 11, the share of resources devoted to Air and Water media peaks in FY 1991 and then declines, reflecting the projected completion of those necessary actions at the majority of sites before FY 1996. For Solid Waste Management, the share of resources remains relatively constant over the period, reflecting the slightly longer time frame (mid-1990s) to complete those actions at the majority of sites. For Remedial Action activities, however, the share of resources is projected to grow significantly over the period, passing the 70 percent share of total environmental corrective actions by FY 1994.

For Safety and Health Corrective Actions, over $2 billion is projected to be required through FY 1995 to address the necessary actions at Nuclear Reactor facilities, Non-Reactor Nuclear facilities, and the Non-Nuclear facilities, as reflected in Section 3 and the site appendices. As shown in Figure 12, actions required at Nuclear Reactor facilities remain relatively constant as a share of total ES&H, while actions required at Non-Reactor Nuclear facilities peak in FY 1992. Actions at Non-Nuclear facilities peak in FY 1994.

TABLE 1
FUNDING PROJECTIONS FY 1988 THROUGH FY 1995
(Millions of FY 1990 Dollars)

	"Expected" and "High" Projections
ENVIRONMENT:	
Base Program	$ 2259
Corrective Actions	
Air	336
Water	546
Solid Waste Management	1563
Remedial Action	3444
Subtotal, Environment	8148
SAFETY AND HEALTH:	
Base Program	2929
Corrective Actions	
Nuclear Reactor	724
Non-Reactor Nuclear	574
Non-Nuclear	903
Subtotal, Safety and Health	5130
TOTAL ES&H	$13278

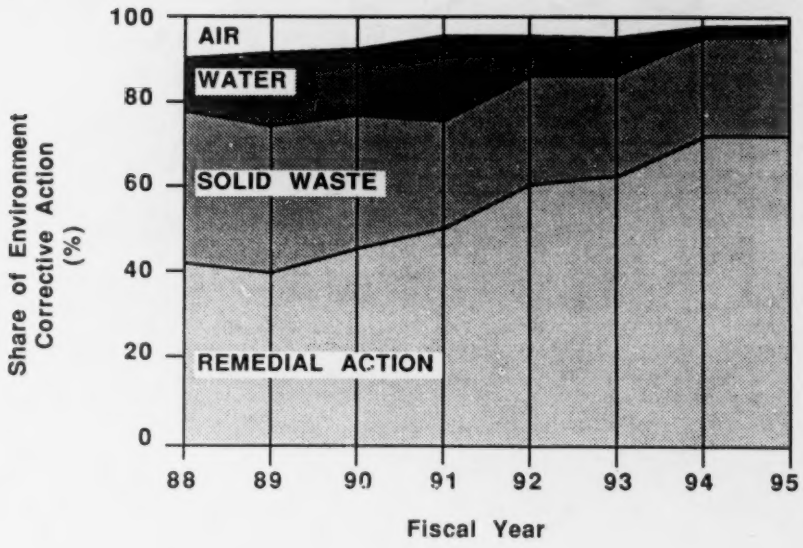

Figure 11:

DOE Defense Complex; Share of Environment Corrective Actions

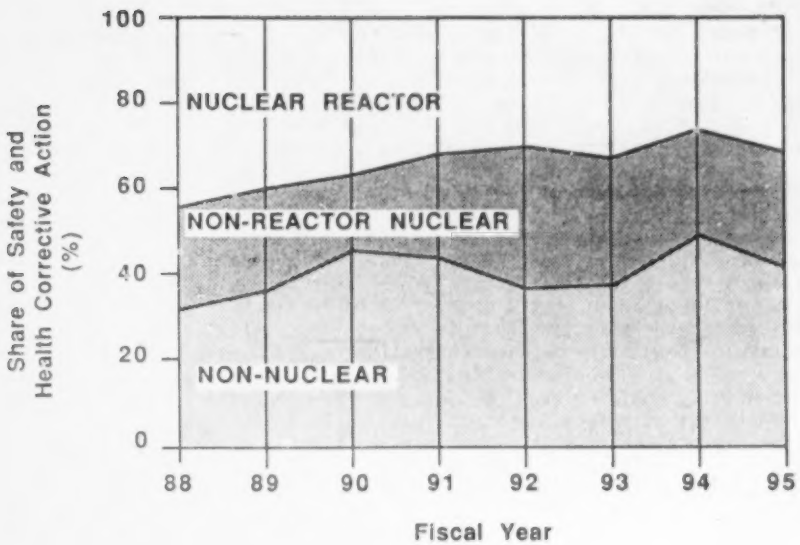

Figure 12:

DOE Defense Complex; Share of Safety and Health Corrective Actions

Table 2 displays the range of projected funding requirements beyond FY 1995 for environment, and for safety and health corrective actions, based on assumptions of necessary actions and estimated years to complete such actions specific to each individual site. The "Expected" column for the majority of sites reflects the best judgment of activities and resources to complete all actions, consistent with 1) today's understanding of clean up requirements, 2) activities to assure continued compliance with those and safety and health requirements, and 3) current agreements with State regulatory bodies and current status of DOE Orders. It implies the level of activity and resources to control and manage the environment, and safety and health situation at each specific site. For all sites, a continuing Federal presence and mission is assumed in the "Expected" projection. The "High" projection for the majority of sites reflects the potential additional corrective actions and resources that could be required if corrective actions are required to meet more stringent interpretations of existing regulations or directives. Beyond the implied control and management of environmental and safety and health problems reflected in the "Expected" projection, some sites potentially could be required to exhume or otherwise totally eliminate the environmental or safety and health problem. The individual site appendices discuss the range of scope between the "Expected" and "High" projections, reflecting their best judgment of the current and potential clean up and corrective action situation at their sites.

TABLE 2:

POST FY 1995 FUNDING PROJECTIONS
(Millions of FY 1990 Dollars)

	To Complete Corrective Actions			
	Environment		Safety and Health	
Site	Expected	High	Expected	High
Feed Materials Production Center	$ 963	$ 1,175	$ 84	$105
Hanford Site	27,000	46,000	30	130
Idaho National Engineering Laboratory	515	2,050	0	10
Kansas City Plant	5	8	2	3
Lawrence Livermore National Laboratory	60	300	0	0
Los Alamos National Laboratory	907	1,432	110	110
Mid-Pacific Area	0	0	0	0
Mound Plant	58	78	0	0
Nevada Test Site	250	750	0	0
Oak Ridge, Y-12 Plant	290	530	50	150
Pantex Plant	104	155	80	80
Pinellas Plant	9	9	0	0
Residual Nuclear Explosive Sites	0	0	0	0
Rocky Flats Plant	120	180	0	0
Sandia National Laboratories/ Albuquerque	55	70	0	0
Sandia National Laboratories/ Livermore	1	3	0	0
Savannah River Plant	349	7,000	800	1,800
SUBTOTAL	$30,686	$59,740	$1,156	$2,388

TOTAL ES&H EXPECTED: $31,842

TOTAL ES&H HIGH: $62,128

Table 3 and Figures 13 and 14 summarize the "Expected" and "High" range of resources. Within those bounds, it is projected that efforts required to achieve compliance with ES&H standards and to clean up contaminated sites could require between $40 billion and $70 billion and could extend beyond FY 2010, as discussed in Section 3 and the site appendices. This is in addition to an ongoing base program of $700 million per year. Over the period of the "Expected" and "High" range, the base program would require between $26 and $40 billion, independent of the need for corrective actions. This projection is based on the level of the environment, and safety and health base programs cumulated over the number of years to complete all corrective actions in either the "Expected" or "High" scenarios. These resources would be required just to maintain compliance levels and would continue each year thereafter, subsequent to completion of corrective actions.

TABLE 3:

TOTAL PROJECTED COSTS
(Billions of FY 1990 Dollars)

	"Expected" Through FY 2025	"High" Through FY 2045
Base Program	26	40
Corrective Actions:		
Environment	37	65
Safety & Health	3	5
Subtotal	40	70
TOTAL ES&H	66	110

The decision to adopt the ES&H activities and resource profiles projected in this report has not been made. When a decision is made, completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal Budget Process. The total resource projections are only illustrative of the magnitude that could be required to accomplish the clean up and compliance activities within the timeframes noted in the report.

The wide range of resource projections reflect the uncertainty of time and definition of scope for activities far beyond the current planning period. The reader should consider, however, the probable impact of additional legislation, changing DOE Orders, and the current state of scientific knowledge on the industrial practices of today, and their cumulative impact on future ES&H activities and resources.

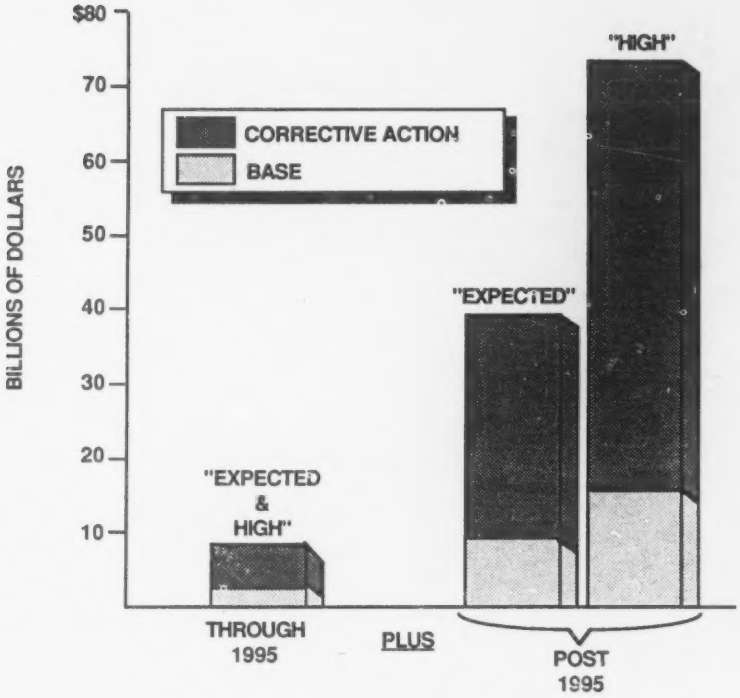

Figure 13:

Environment Funding Projections

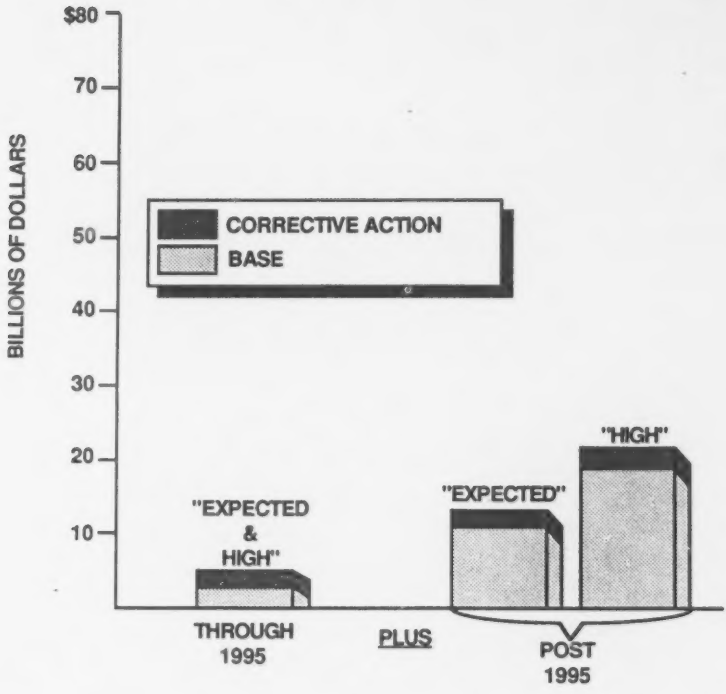

Figure 14:

Safety And Health Funding Projections

ATTACHMENT 1

List of Major Applicable Legislation

Clean Water Act (1948)

Atomic Energy Act (1954)

Clean Air Act (1963)

National Historic Preservation Act (1966)

Occupational Safety and Health Act (1970)

National Environmental Policy Act (1970)

Noise Control Act (1972)

Federal Insecticide, Fungicide, and Rodenticide Act (1972)

Endangered Species Act (1973)

Safe Drinking Water Act (1974)

Resource Conservation and Recovery Act (1976)

Toxic Substances Control Act (1976)

Comprehensive Environmental Response, Compensation, and Liability Act (1980)

Fish and Wildlife Conservation Act (1980)

Hazardous and Solid Waste Amendments (1984)

Superfund Amendments and Reauthorization Act (1986)

Emergency Planning and Community Right to Know Act (1986)

ATTACHMENT 2

Department of Energy (DOE) Environment, Safety and Health (ES&H) Orders

DOE 5000.3	Unusual Occurrence Reporting System
DOE 5400.2	Environmental Compliance Issue
DOE 5440.1C	Implementation of The National Environmental Policy Act
DOE 5480.1B	Environmental Protection, Safety, and Health Protection Program for DOE Operating
DOE 5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances and Hazardous Wastes
DOE 5480.4	Environmental Protection, and Health Protection Standards
DOE 5480.5	Safety of Nuclear Facilities
DOE 5480.6	Safety of DOE-Owned Nuclear Reactors
DOE 5480.7	Fire Protection
DOE 5480.8	Contractor Occupational Medical Program
DOE 5480.9	Construction Safety and Health Program
DOE 5480.10	Contractor Industrial Hygiene Program
DOE 5480.11	Requirements for Radiation Protection
DOE 5480.12	Prevention, Control, and Abatement of Environmental Pollution
DOE 5480.13	Aviation Safety
DOE 5480.14	Comprehensive Environmental Response, Compensation, and Liability Act Program
DOE 5480.15	DOE Laboratory Accreditation Program for Personnel Dosimetry
DOE 5480.16	Firearms Safety
DOE 5481.1B	Safety Analysis and Review System
DOE 5482.1B	Environmental Protection, Safety, and Health Protection Appraisal Program
DOE 5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned and Contractor Operated (GOCO) Facilities
DOE 5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
DOE 5500.3	Reactors and Non-Reactor Nuclear Facility Emergency Planning Preparedness, and Response Program for DOE Operations
DOE 5700.6B	Quality Assurance

APPENDICES

INTRODUCTION

The following appendices have been developed for each of the seventeen sites designated as the DOE defense complex. They are:

- Feed Materials Production Center (Ohio)
- Hanford Site (Washington)
- Idaho National Engineering Laboratory (Idaho)
- Kansas City Plant (Missouri)
- Lawrence Livermore National Laboratory (California)
- Los Alamos National Laboratory (New Mexico)
- Mid-Pacific Area (Marshall Islands, Johnston Atoll)
- Mound Plant (Ohio)
- Nevada Test Site (Nevada)
- Oak Ridge, Y-12 Plant (Tennessee)
- Pantex Plant (Texas)
- Pinellas Plant (Florida)
- Residual Nuclear Explosive Sites (Nevada, Mississippi, Alaska, New Mexico, and Colorado)
- Rocky Flats Plant (Colorado)
- Sandia National Laboratories/Albuquerque (New Mexico)
- Sandia National Laboratories/Livermore (California)
- Savannah River Plant (South Carolina)

The appendices to this report have been developed to provide summary information for each of the seventeen sites. If needed, more specific information is available from the site ES&H long range plans, resident with the responsible DOE operations office. The information that is presented in the appendices to this report includes: 1) site mission; 2) key areas of ES&H focus for the specific site; and 3) ES&H resource projections for the site.

Table 1 of each appendix provides a resource projection for the FY 1988 through FY 1995 horizon. Through FY 1995, the resources are based on the most comprehensive data possible, incorporating all known and potential ES&H actions to address current requirements unique to each site. This table is the basis for the cumulative data reflected in the tables and figures in Section 4 of the report. Tables 2 and 3 of each appendix provide a projection of the range of years and resources beyond FY 1995 to complete ES&H corrective actions.

The data beyond FY 1995 capture the full range of possible ES&H corrective actions to address known ES&H problems. The "Expected" projection is intended to reflect each site's best judgment of the years and resources to complete all actions, consistent with 1) today's understanding of clean up requirements, 2) activities to assure continued compliance with those and safety and health requirements, and 3) current agreements with State regulatory bodies and current status of DOE Orders.

The "High" projection is intended to reflect each site's potential additional corrective actions and resources that could be required should a stricter interpretation and agreement between sites and their localized situation be applied in addressing known ES&H problems.

Appendix
A

SUMMARY OF THE FEED MATERIALS PRODUCTION CENTER ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Feed Materials Production Center (FMPC), located near Cincinnati, Ohio, and administered by the DOE Oak Ridge Operations Office, is the processing of uranium compounds to metal; production of depleted uranium billets for weapons production and depleted uranium target elements for production reactors; and maintaining the capability to produce slightly enriched uranium fuel billets.

II. KEY AREAS OF ES&H FOCUS

The Department has identified the following key areas of focus where corrective actions are needed to ensure compliance with DOE and other regulatory requirements at FMPC. Specific agreements exist with the state and Federal environmental protection agencies that mandate specific schedules for certain of these compliance actions.

Reduction of Air Emissions

The following projects have been identified as necessary to ensure continued compliance with both EPA and DOE emissions requirements:

- Replace/upgrade Dust Collection System ($37.9 million),
- Oxides of Nitrogen Destructor, Plant 9 Pickling ($1.5 million), and
- K-65 Silo Stabilization for Radon Emissions Control and Structural Stability ($3.0 million).

Remedial Action at Surface Impoundments, Landfills, and Silos

As part of the remedial action strategy, three broad categories of remedial action have been proposed: surface water controls, groundwater controls, and direct treatment methods. Remedial action projects for surface and groundwater controls include:

- Control Storage Pads ($2.6 million),
- Plant 1 Control Pad and Shelter ($30.1 million),

- o RMI Wastewater Treatment Facility ($0.7 million),
- o Wastewater Treatment Improvement and Waste Recycle ($10.9 million),
- o Pilot Plant Sump System Improvements ($2.9 million), and
- o In-Process Storage Improvements ($7.6 million).

Projects identified for direct treatment methods include:

- o Thorium Removal, Plant 8 ($2.3 million),
- o Uranium Reduction in Off-Site Wells ($4.1 million),
- o Waste Pit and Silo Remediation ($40.0 million), and
- o RMI Remedial Activities ($5.9 million).

Reduction in Worker Exposure

The strategy established for controlling worker radiation exposure has been divided into four broad areas of required corrective actions: containment of radioactive and toxic materials, control of external radiation exposures, improved work place monitoring, and improved medical monitoring. Each of these four areas has its own strategy for meeting established requirements. Line item construction projects identified to implement the strategy for reduction of worker exposures to radiation include:

- o Locker Room Modifications ($7.2 million),
- o Enclose Saws and Lathes ($2.0 million),
- o General Plant Ventilation Upgrade ($55.0 million),
- o Material Handling Improvements ($21.6 million), and
- o Receiving and Material Inspection Facility ($4.0 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Feed Materials Production Center. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

Remedial action planning, in part, assumes removal of radioactive and mixed wastes for treatment and above ground entombment, and in situ stabilization of other waste materials such as fly ash and sanitary waste. The differences between the expected and high projections in Table 3 reflect uncertainties in the extent of the quantities of materials that must be handled and the treatment/storage methods that will be required.

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TABLE 1
FEED MATERIALS PRODUCTION CENTER
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	4.5	5.1	3.9	4.4	6.2	6.2	6.2	6.2
Corrective Actions								
Air	27.2	30.6	32.1	6.9	18.5	7.7	7.7	6.8
Water	8.1	25.3	30.5	64.0	14.9	3.0	3.0	3.0
Solid Waste Management	3.9	4.6	3.8	4.1	23.3	22.5	21.3	17.6
Remedial Action	19.6	11.5	28.1	79.3	79.7	63.4	68.1	77.0
Subtotal, Environment	63.3	77.1	98.4	158.7	142.6	102.8	106.3	110.6
SAFETY AND HEALTH:								
Base Program	16.8	14.9	14.6	13.3	15.7	15.7	15.7	15.7
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	11.2	25.9	15.7	1.8	7.4	3.8	1.7	2.7
Non-Nuclear	16.9	12.6	11.1	1.6	11.0	5.6	3.4	5.1
Subtotal, Safety and Health	44.9	53.4	41.4	16.7	34.1	25.1	20.8	23.5
TOTAL ES&H	108.2	130.5	139.8	175.4	176.7	127.9	127.1	134.1

NA - Not Applicable

TABLE 2

FEED MATERIALS PRODUCTION CENTER (FMPC)
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	2	5
Water	5	10
Solid Waste Management	5	10
Remedial Action	5	20
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	2	5
Non-Nuclear	2	5

NA - Not Applicable

TABLE 3

FEED MATERIALS PRODUCTION CENTER
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	963	1,175
Safety and Health	84	105
Total ES&H	1,047	1,280

Appendix
B

SUMMARY OF THE HANFORD SITE ENVIRONMENTAL, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The mission of the Hanford Site, administered by the DOE Richland Operations Office, falls into the following major categories:

Defense Related Activities

- Defense Production Operation--Prior to the decision to place N Reactor in cold standby, uranium fuel assemblies were irradiated in N Reactor to produce plutonium. N Reactor supplied byproduct steam for the production of up to 860 megawatts of electricity to the Washington Public Power Supply System. Spent fuel rods are chemically processed at the Plutonium Uranium Extraction Plant (PUREX) where plutonium and uranium are recovered and purified. The uranium is further processed at the Uranium Oxide (UO3) Plant to prepare it for recycle off-site. The plutonium is processed into metal at the Plutonium Finishing Plant (PFP) for shipment to Rocky Flats.

- Defense Waste and Environmental Management--About 440,000 cubic yards of high-level (HL), transuranic (TRU), and tank wastes generated in the production of defense materials are stored and managed at Hanford. Older liquids, which are stored in tanks, are being solidified into a salt form. Double-shell tanks are being used to store remaining liquids. Technology is being developed and options considered in an Environmental Impact Statement decision process for ultimate disposal of all defense HL, TRU, and tank wastes.

  Work is also being conducted on converting highly radioactive liquid wastes into glass for long-term storage in a geologic repository and for demonstrating the grouting of low-level radioactive liquid waste in vaults located near the surface on the Hanford Site.

Non-Defense Related Activities

- Advanced Reactor Development--The fast Flux Test Facility (FFTF) reactor provides irradiation test conditions for fuels and materials for advanced liquid metal reactors. The FFTF is located in the Materials Development Complex which includes the Fuel Cycle Plant

(FCP), the Fuels Storage Facility, and the Maintenance and Storage Facility. Research and development of advanced materials and fuels are also ongoing in the 300 Area facilities.

The SP-100 Ground Engineering Test and irradiation of fuels and materials for space application are being conducted for the National Aeronautics and Space Administration, the Department of Energy (DOE), and the Department of Defense. The FFTF also provides irradiation support for international programs.

Radioisotope Thermal Generator Systems encapsulation of Pu-238 work will be done in the FCP.

- o Research and Development--Research on fossil, solar, and nuclear fission and fusion energy is performed in the 300 Area. Extensive environmental, biomedical, and materials research is also underway.

II. KEY AREAS OF ES&H FOCUS

DOE has identified the following key areas of focus of Environment, Safety and Health (ES&H) corrective actions at Hanford.

Resource Conservation and Recovery Act Compliance

The RCRA compliance activities at Hanford currently emphasize the permitting of treatment, storage, and disposal (TSD) facilities and the assessment of Hanford operations for environmental compliance. Part A permits for all identified TSD facilities were submitted to Washington's Department of Ecology in May, 1988. Funding is being identified and priorities established for writing the required Part B operating permits or closure plans. Several Part B permits and closure plans are in various stages of completion, including review and comment by the regulatory agencies.

Compliance assessments for six major facilities at Hanford have been completed, and plans for actions to correct the deficiencies noted are being developed. The waste stream characterization program is a major effort in providing data required for determining compliance. Additional facilities are being assessed for environmental compliance during FY 1988. These assessments will serve as a baseline for future environmental compliance audits.

The RCRA compliance is supported by a Hanford Environmental Compliance Line Item (LI). Specific capital funding requirements are estimated as follows:

- o Ground Monitoring Wells ($12.0 million),
- o Radioactive Mixed Waste Storage ($15.5 million),

- Cathodic Protection Systems ($6.7 million),
- 300/400 Area Waste Water Facilities ($1.5 million),
- B Plant Upgrades ($11.3 million),
- Treated Effluent Disposal Facility ($2.5 million),
- Other (Solid Waste Treatment, Compliance, Etc.) ($37.0 million), and
- Laboratory Upgrades ($18.5 million).

The Grout Treatment and Disposal Program is included in environmental compliance plans. The Grout Treatment Facility will mix low-level liquid waste with cementitious materials to form a slurry that will be pumped to RCRA-compliance underground concrete vaults for solidification and final disposal.

Environmental Restoration

The primary objectives of the environmental restoration activity at Hanford is to remediate its numerous inactive sites; i.e., Comprehensive Environmental Response Compensation and Recovery Act and RCRA 3004 (u) activities. This program is divided into three major categories: those activities supporting the remedial investigation/feasibility studies (RI/FS) for the four aggregated National Priority List sites at Hanford; the waste characterization and related activities for the single-shell tanks (SSTs); and the technology development activities required to successfully remediate these inactive sites. Alternatives for SST restoration range from in-place disposal to recovery, pretreatment, and disposal as glass and grout. The lower bound of disposal options includes dome fill and installation of a barrier and marker system over all 149 SSTs. The upper bound includes retrieval and processing, transportation, and repository fees for the 37 million gallons of waste in all 149 tanks, and final disposition of the tanks.

Funding for this program is specifically allocated as a separate budget from ongoing operational funding in order to provide both visibility and impetus for this important activity. While it is projected that completion of the planned restoration activities at the Hanford Site will require billions of dollars and extend well into the 21st century, this program is key to developing the staff, technical expertise, and knowledge of the site necessary to effectively and efficiently remediate Hanford's inactive sites.

Funding estimates for environmental restoration through FY 1995 are shown below:

- Preliminary Assessment/Site Investigation ($9.0 million),
- 100 Areas RI/FS ($231.9 million),

- o 300 Area RI/FS ($16.3 million),
- o 1100 Area RI/FS ($13.7 million),
- o 200 Areas RI/FS ($223.1 million),
- o SST Restoration ($59.2 million),
- o Technology ($48.9 million),
- o Interim Remedial Actions ($39.7 million), and
- o Management and Planning ($16.7 million).

Alternatives to Soil Column Disposal

The alternative to soil column disposal of hazardous waste is a two-phased program. The first phase is projected to reduce the activity of the radionuclides discharged to soil columns by 98 percent and will be implemented by 1995. The major sources of reduced activity occur as a result of improvements to operations at N Reactor and in the chemical reprocessing/waste management facilities. An estimated $95M of capital funding has been identified in the Hanford Environmental Compliance Line Item (LI) to implement the proposed changes to operations and is allocated for Phase I as follows:

- o B Plant Condensate Process Treatment Facility ($14.7 million),
- o PFP Liquid Low-Level Waste System Modification ($5.3 million),
- o PUREX Liquid Effluent Treatment ($13.0 million),
- o UO3 Liquid Effluent Treatment ($13.0 million),
- o Final Disposal Systems ($21.0 million), and
- o Other (Waste Water, Chemical Sewer Treatment, Etc.) ($3.0 million).

Facility Safety Upgrades

Facility safety upgrades will focus on the following major areas:

- o Enhanced exposure monitoring and reduction of internal and external exposure to employees

  Enhanced exposure monitoring of employees will be accomplished through the deployment of state-of-the-art dosimetry systems, improvement in the work place air sampling programs, provision of additional engineered barriers between the employee and radiation source, and significant cleanup of contaminated areas both within operating facilities and in outdoor work management areas. Access

control systems for radiation zones will be implemented, and additional computerized work station dosimetry projections will be used along with real time exposure rate measurements. Major activities include:

- o Upgrade of Air Sampling and Monitoring ($7.4 million), and
- o Dosimetry Upgrades ($7.3 million).

o Improved Control of radioactive materials

Improved control of radioactive materials will be accomplished by upgraded monitoring of effluents for radioactivity, decontamination of contaminated areas, and access control to contaminated areas. Major activities include:

- o Monitoring Access Control ($11.3 million), and
- o Decontamination ($8.0 million).

o Improved fire protection systems to meet improved risk criteria

Many facility fire protection systems and fire protection water systems are in need of upgrade to meet the improved risk criteria of DOE. Detection and alarm systems are in need of upgrade due to age and technology. The fire protection water systems available to many facilities do not have the necessary redundancy, reserve, or pump capacity. Major activities include:

- o Upgrade Fire Water System ($5.0 million), and
- o Upgrade Detection and Alarm Systems ($3.5 million).

o Asbestos abatement

Because of the age of many of the Hanford facilities, an aggressive asbestos abatement program must be continued in order to comply with applicable requirements, especially those of the Washington State Department of Labor and Industries. A major activity is:

- o Asbestos abatement ($TBD).

N Reactor Safety Upgrades--$110 Million (through FY 1989)

The Safety Enhancement Program (SEP) for N Reactor was developed in response to expert safety reviews and is intended to reduce the probability of accidents and improve the outcome should an accident occur. The program addresses safety recommendations within the areas of plant modifications, technical studies and evaluations, training, and administration. In addition to the SEP, the N Reactor has other safety

improvements underway. The evaluation of the effect of the N Reactor standby on resource allocations to individual projects has not been completed. Upgrades in progress to support improvements are:

- o Hydrogen Mitigation,
- o Confinement/Habitability,
- o Surveillance/Monitoring,
- o Liquid Waste Discharge Reduction/Exposure Reduction,
- o Upgraded Emergency Core Cooling,
- o Safety Analysis, and
- o Probabilistic Risk Assessment.

Nuclear Safety Analysis--$7.0 Million (through FY 1995)

A number of the defense production and defense waste management facilities located in the 200 Areas were constructed in the 1940s and 1950s. These older facilities were not designed to meet many of the current requirements that are imposed on new facilities. In some cases, systematic reviews must be made to establish the ability of these facilities to ensure confinement of radioactive material under design base accident conditions. Other reviews indicate the ventilation system, emergency power system, and other safety-related equipment may require upgrades to meet the reliability, redundancy, or environmental qualification of current generation safety-related equipment.

To totally scope the areas potentially requiring upgrades will require that the safety analyses for the various facilities be revised to standards identified in DOE Order 5480.5, "Safety of Nuclear Facilities." The analyses will provide systematic identification of safety-related equipment and facility deficiencies. For facilities where operations are planned to continue beyond 1990, all systems required for confinement of radioactive material for normal and accident conditions should be upgraded to current standards or shown to be acceptable based on residual risk.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Hanford Site. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The corrective action estimates represent all identified corrective actions (or environmental remediations) which are known at the time. These are developed from:

- Findings from DOE-RL and contractor audits and appraisals relating to DOE Orders,
- DOE-HQ/EH technical safety appraisals,
- Various N Reactor, DOE-RL, and off-site expert reviews,
- Findings from Environmental Surveys, and
- State compliance orders.

Beyond 1995, the RI/FS activities initiated pre-1995 would be completed, and remedial activities would be continued and/or initiated and completed over an assumed 30-year period. The extent and costs of the remedial efforts will depend on results of the RI/FS process (which require public involvement and regulatory approvals) for the inactive waste sites. For example, costs will vary greatly depending on the extent of exhumation/treatment required.

For purposes of this plan, two levels of remediation were developed, an "expected level," and a "high level." The expected level assumes completion of characterization on about 700 of the 1200 identified inactive waste sites, and a mix of exhumation/treatment, in place treatment, and/or capping of most of these sites. The remaining 500 sites were assumed to require only minor remedial action. The expected value also includes characterization and remedial actions for 149 single shell tanks containing mostly solidified high-level and chemical wastes. The total cost of this level of cleanup is estimated at $27 billion.

The "high case" assumes exhumation, thermal treatment, and disposal of residue in permitted facilities for most of the inactive waste units identified as requiring remedial action; that is, very little waste would be left in place. The determination as to the need for this level of cleanup will only be made as a result of the RI/FS process. Additionally, this case assumes total exhumation/treatment of the wastes in the single shell tanks.

For both cases, it is assumed that remediation efforts would be sufficient to permit unrestricted surface access to the areas remediated, including use for agriculture. For the "high case," restrictions on excavation and drilling would be significantly fewer (for the expected case, many restricted areas would be protected by barriers and marker systems).

TABLE 1
HANFORD SITE
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	61.0	58.5	73.6	88.2	103.9	96.0	92.0	95.0
Corrective Actions								
Air	3.6	0.9	0.7	0.7	0.7	0.7	0.7	0.7
Water	2.9	2.7	1.2	1.2	0.7	1.4	1.3	1.3
Solid Waste Management	34.5	51.7	70.1	108.4	119.1	98.8	87.6	69.7
Remedial Action	15.5	17.8	19.8	60.8	90.5	150.5	150.8	150.8
Subtotal, Environment	117.5	131.6	165.4	259.3	314.9	347.4	332.4	317.5
SAFETY AND HEALTH:								
Base Program	39.1	31.3	40.7	63.4	50.7	31.4	26.0	25.7
Corrective Actions								
Nuclear Reactor	33.1	22.0	10.5	5.7	3.6	3.5	2.6	2.6
Non-Reactor Nuclear	5.7	6.4	6.4	8.2	13.8	5.3	5.4	5.4
Non-Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0 0	0.0
Subtotal, Safety and Health	77.9	59.7	57.6	77.3	68.1	40.2	34.0	33.7
TOTAL ES&H	195.4	191.3	223.0	336.6	383.0	387.6	366.4	351.2

TABLE 2

HANFORD SITE
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	1
Water(1)	7	>10
Solid Waste Management(2)	7	10
Remedial Action	30	50
SAFETY AND HEALTH		
Corrective Actions		
Nuclear Reactor	0	0
Non-Reactor Nuclear	6	12
Non-Nuclear	0	0

(1) Plan and Schedule to Discontinue Disposal of Contamination Liquids into the Soil Column at the Hanford Site.

(2) Storage currently compliant; final disposal is being addressed.

TABLE 3

HANFORD SITE
POST FY 1995 ES&H RESOURCE PROJECTIONS(1)
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment(2)	27,000	46,000
Safety and Health	30	130
Total ES&H	27,030	46,130

(1) Current outyear projections are highly speculative due to:

(a) the uncertainty of future regulatory requirements;

(b) the uncertainty of future cleanup standards;

(c) the uncertainty of future decisions by the State of Washington Department of Ecology (Ecology) and the Environmental Projection Agency (EPA) for the cleanup of Hanford; and

(d) the incomplete characterization of mixed waste sites at Hanford.

(2) The Environmental values reflect the cost ranges to complete work currently identified in the Hanford Environmental Restoration Program (inactive waste sites) and by the Defense Waste EIS (single shell tank waste). The cost values are intended to not presume the outcome of any decision processes not yet completed concerning what environmental work is to be accomplished and how it is to be accomplished. The values are therefore for planning use only.

Appendix
C

SUMMARY OF THE IDAHO NATIONAL ENGINEERING LABORATORY ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Idaho National Engineering Laboratory (INEL), located near Idaho Falls, Idaho, and administered by the DOE Idaho Operations Office, includes nuclear reactor testing, processing of spent nuclear fuel, and research and development. EG&G Idaho conducts nuclear reactor development testing, scientific and engineering research, and waste management activities. EG&G Idaho also provides general support services for the INEL. Westinghouse Idaho Nuclear Company (WINCO) operates the Idaho Chemical Processing Plant (ICPP) for the processing of spent fuel from Navy, research, and miscellaneous other reactors. Also at the INEL, Argonne National Laboratory-West (ANL-W) performs activities for the Chicago Operations Office. Finally, Westinghouse Electric Corporation operates the Naval Reactors Facility (NRF) at the INEL for the Pittsburgh Naval Reactors Office. The ES&H activities of these latter two contractors are reported through their own Field Offices and are not included here. However, close cooperation is maintained among all INEL organizations on ES&H issues of common concern.

II. KEY AREAS OF ES&H FOCUS

The major ES&H activities areas and issues facing the INEL are listed below, along with the strategies for resolution.

RCRA/CERCLA Remedial Action (estimated cost $65 million)

- Problem Statement: DOE-ID is operating under a Consent Order and Compliance Agreement (COCA) with EPA, Region X, covering both land disposal units and solid waste management units. Included are 298 units at the INEL under EG&G Idaho or WINCO cognizance. Characterization and possible remedial actions are required for these units under RCRA Section 3004(u). If EPA is not satisfied that progress is being made on the remedial actions, the RCRA Part B permit for current waste treatment and storage facilities will not be issued.

- Issues: How to make satisfactory progress under the COCA, in spite of major uncertainties in (a) funding levels, (b) eventual cleanup requirements, (c) different costs for different cleanup options, (d) cleanup schedules required by EPA, (e) pending State primacy under RCRA, and (f) DOE-HQ/EPA-HQ agreements on CERCLA.

- Strategy: Establish a RCRA/CERCLA Remedial Action Program. Carry out the EPA requirements through the COCA in a strict fashion. Move toward full compliance with RCRA Section 3004(u) by addressing the disposal units as rapidly as funding permits. Work with EPA to achieve a balanced emphasis, through remediating high-priority units and deleting low-priority units from the list. Keep the State of Idaho involved to help ensure a smooth transition to State primacy.

Subsurface Migration at the RWMC (estimated cost $2 billion)

- Problem Statement: Subsurface migration of transuranic (TRU) radionuclides and volatile organic chemicals (VOCs) has occurred from TRU waste buried before 1970 at the Radioactive Waste Management Complex (RWMC). The 2 million cubic feet of waste contains at least 381 kg of transuranics and 88,400 gal of organics. The VOCs have reached the underlying aquifer, at 580 ft, and the drinking water at the RWMC. The TRU radionuclides have migrated downward 110 ft, and possibly as much as 240 ft. A formal confirmation of the VOC release was transmitted recently from DOE-ID to EPA.

- Issues: How to determine and carry out the most appropriate near-term and long-term remedial actions at the RWMC, while complying with the provisions of the COCA with EPA.

- Strategy: Define the RWMC as a release site, and comply with the terms of the COCA as related to that site. Establish a Buried Waste Remedial Action Program. Characterize the release through enhanced environmental sampling and transport modeling. Evaluate and implement options for near-term remedial action. Develop innovative technology for and implement a long-term, permanent remedial action (e.g., retrieve the waste or improve in-place confinement).

Drinking Water at TAN

- Problem Statement: VOCs have also been found in production wells and in drinking water at the Test Area North (TAN). Some of the measured concentrations slightly exceed the maximum allowable contaminant levels that will soon become effective under the amendments to the National Primary Drinking Water Regulations. A formal confirmation of the release was transmitted recently from DOE-ID to EPA.

- Issues: How to ensure that TAN drinking water and the underlying aquifer remain in compliance with regulations.

- Strategy: Define TAN as a release site under the COCA. Enhance monitoring of test wells and production wells. Characterize potential sources of the contaminants. Determine the best available technology for remedial action, and implement it as necessary. Improve monitoring of all drinking water supplies.

NOX Abatement (estimated cost $35 million)

- Problem Statement: Radioactive waste processed in the New Waste Calcining Facility (NWCF) at the ICPP contains nitrate compounds which decompose to NOX. About 90 percent of the NOX is NO2, a reddish-brown gas. When the NWCF is operating, a colored, highly visible plume discharges from the main stack. Under certain climatic conditions, this plume can be seen for long distances. An agreement with the State of Idaho, the ICPP will install best available control technology to severely restrict NOX emissions.

- Issue: How to significantly reduce the release of NOX.

- Strategy: The preferred NOX abatement system is a selective catalytic reduction process designed to reduce emissions by at least 90 percent. Provisions for installation of such a process have already been initiated. A pilot-scale unit will be operated in FY 1989 to confirm the efficacy of the process. Construction of a full-scale system is scheduled to begin in FY 1992.

PEW Condensate Treatment by Acid Fractionation (Liquid Effluent Treatment and Disposal) (estimated cost $16.1 million)

- Problem Statement: The Process Equipment Waste (PEW) evaporator system at the ICPP receives low-level radioactive liquids for concentration. The evaporator overhead stream is condensed and released to a waste stream if radioactivity is below release limits. The waste stream is pumped to percolation ponds. Although release of the waste stream meets all current limits, increases in future processing rates could result in the radioactivity levels exceeding release limits.

- Issue: How to ensure that the waste stream meets release limits despite increased processing rates.

- Strategy: The proposed option is to distill the evaporator overhead waste streams in an acid fractionator column. Radionuclides and chemicals would concentrate in the column bottoms, which would then be captured and solidified for storage at the existing waste calcining facility. Fractionator overhead waste streams would form a reduced-activity stream, which would be filtered and discharged to the atmosphere. Flow of radionuclides to the percolation pond would be eliminated.

Additional Issues

Additional issues, the strategies for which are less well-defined at present, include (a) how to bring underground storage tanks into compliance with new regulations, (b) how to comply with RCRA for mixed wastes, and (c) how to comply with new regulations on personnel monitoring for exposure to non-radiological hazards.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Idaho National Engineering Laboratory. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" estimate of $2.0 billion in Table 3 is based upon full retrieval and processing of the Buried TRU Waste at the RWMC. Low Level Waste would be left in place with improved confinement. The Table 3 "expected" estimate of $500 million is based upon no retrieval but complete stabilization of both the Buried TRU and Low Level Waste. This is highly dependent on technical considerations, migration rates, and ultimately, EPA agreement.

TABLE 1
IDAHO NATIONAL ENGINEERING LABORATORY
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	12.0	14.0	13.7	15.5	17.8	13.4	12.4	13.2
Corrective Actions								
Air	0.5	0.0	0.0	4.0	6.0	10.0	15.0	0.0
Water	0.2	0.6	1.6	2.2	1.1	1.1	0.0	0.0
Solid Waste Management	0.0	5.1	8.4	9.1	8.6	5.9	2.8	3.0
Remedial Action	12.5	19.4	35.0	41.0	48.9	28.0	39.0	47.0
Subtotal, Environment	25.2	39.1	58.7	71.8	82.4	58.4	69.2	63.2
SAFETY AND HEALTH:								
Base Program	16.5	20.4	15.8	18.1	18.9	17.5	16.2	16.2
Corrective Actions								
Nuclear Reactor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Reactor Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Nuclear	0.0	0.0	3.5	15.1	5.2	1.6	0.1	0.1
Subtotal, Safety and Health	16.5	20.4	19.3	33.2	24.1	19.1	16.3	16.3
TOTAL ES&H	41.7	59.5	78.0	105.0	106.5	77.5	85.5	79.5

TABLE 2

IDAHO NATIONAL ENGINEERING LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	5
Water	0	5
Solid Waste Management	12(1)	25(1)
Remedial Action	10-20(2)	30(2)
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	0	5
Non-Reactor Nuclear	0	3
Non-Nuclear	0	3

(1) Depends upon funding level for operation of Stored Waste Examination Pilot Plant (SWEPP) facility at the RWMC.

(2) Depends upon long-term management option selected for Buried Waste Remedial Action.

TABLE 3

IDAHO NATIONAL ENGINEERING LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	515	2,050
Safety and Health	0	10
Total ES&H	515	2,060

Appendix
D

SUMMARY OF THE
KANSAS CITY PLANT
ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN
1988

I. SITE MISSION

The Allied-Signal Inc. Kansas City Division is the prime contractor operating the Kansas City Plant (KCP) for the U.S. DOE Albuquerque Operations Office. This division manufactures non-nuclear weapon components involving machining, plastics fabrication, plating, and electrical and mechanical assembly. The Integrated Circuits Facility located in Albuquerque manufactures Radiation Hardened Integrated Circuits (RHIC) for the Kansas City Plant.

II. KEY AREAS OF ES&H FOCUS

The following have been identified as the key areas of focus of ES&H corrective actions and plant upgrades at the Kansas City Plant:

Plant Upgrades to Assure Compliance with Hazardous Waste Handling and Spill Control Regulations.

The U. S. Environmental Protection Agency (EPA) regulates hazardous waste handling through the Resource Conservation and Recovery Act (RCRA) and the Toxic Substance Control Act (TSCA). While RCRA and TSCA regulate spill control for hazardous waste, EPA requires additional spill reporting for specified hazardous materials through the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

The major projects designed to ensure compliance with these regulations are:

- o Flood Protection Improvements ($7.2 million),
- o Protection of Waste Storage Areas ($1.0 million), and
- o Solvent Reclamation Facility ($1.1 million).

Cleanup and Elimination of PCBs from Plant Environs

Heat transfer systems used at the KCP were originally filled with various PCB heat transfer fluids. Spills and leaks from these systems, combined with the presence of PCB filled capacitors and transformers which have

leaked over the years, have led to widespread contamination at the KCP. The following are major projects designed to eliminate PCB contamination, clean up stormwater discharges regulated by NPDES permit under the Clean Water Act (CWA), and help the KCP to maintain compliance with TSCA's PCB regulations. Major activities include:

- o Cleanup and Elimination of Discharges Potentially Contaminated with PCBs ($8.7 million),
- o Environmental Hazards Elimination Phase III, Subproject B: PCB Fire Hazard Elimination ($2.6 million), and
- o Eliminate PCBs from Industrial and Sanitary Sewer Discharges ($45.3 million).

Cleanup and Protection of Groundwater

Cleanup and protection of groundwater has been emphasized at KCP. Releases and potential releases of hazardous or toxic substances are regulated under the RCRA and the CERCLA by EPA. The source of the substance determines the enforceable regulation. Listed below are some projects designed to clean up and protect groundwater. Major activities include:

- o Trichloractheline Spill Area ($1.5 million),
- o Northeast Area Groundwater Restoration ($0.8 million), and
- o Environmental Hazards Elimination Phase IV, Subproject D: Sealed Sanitary Sewage and Industrial Wastewater In-Ground Pipe Chase ($8.6 million).

Increased Treatment and Protection of Water Effluents

The following list of projects all focus on maintaining compliance with NPDES permits under the CWA and local regulations. The lagoon removal is also required to maintain compliance with the RCRA.

- o Alternative to Operating the South Lagoon and South Lagoon Removal ($3.3 million),
- o Fluoride Treatment at Albuquerque Facility ($0.2 million),
- o Tertiary Treatment ($2.5 million),
- o Environmental Hazards Elimination Phase IV, Subproject A: Surface Water Runoff Retention ($3.3 million), and

- Environmental Hazards Elimination Phase IV, Subproject C: Separate Plant Discharges from Storm Water Effluent System ($0.3 million).

Upgrade Plant and Personnel Protection Capabilities

DOE Orders and NEPA codes are followed to establish and maintain fire safety at the KCP. Some projects listed below are designed to ensure protection of plant personnel, to protect the plant and equipment, and to upgrade existing facilities to meet the applicable DOE Orders and pertinent codes.

- Replace Valves in Fire Protection Main ($2.5 million),
- Environmental Hazards Elimination Phase V, Subproject B: Upgrade Life Safety-Main Factory ($3.3 million),
- Environmental Hazards Elimination Phase V, Subproject A: Upgrade Automatic Sprinkler Systems ($3.2 million),
- Environmental Hazards Elimination Phase V, Subproject D: Upgrade Plant Firewalls ($9.4 million), and
- Replace Plant Evacuation Notification System ($5.2 million).

Plant Upgrades and Cleanups to Eliminate and Prevent Safety Hazards

The following projects are designed to eliminate existing safety hazards at the KCP and to prevent additional safety hazards. These projects will upgrade the KCP to create a safer work environment for KCP personnel.

- Environmental Hazards Elimination Phase III, Subproject A: Decontamination Heavy Machining Inspection Department ($2.0 million),
- Environmental Hazards Elimination Phase IV, Subproject B: Emissions Control for Roof Exhausts ($16.4 million),
- Program Consultant Study of the Plant-Wide LN2 and CO2 Cryogenic System ($10.0 million),
- Asbestos Abatement ($8.0 million), and
- Environmental Hazards Elimination Phase III, Subject C: Upgrade Life Safety Air Handling Systems ($1.0 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Kansas City Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

TABLE 1
KANSAS CITY PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	3.9	4.1	3.7	3.9	4.0	4.1	4.2	4.2
Corrective Actions								
Air	0.0	0.0	0.0	0.0	16.4	0.0	0.0	0.0
Water	0.2	0.2	0.9	5.2	7.2	42.7	0.0	0.0
Solid Waste Management	4.7	6.0	5.7	11.6	10.3	9.0	0.5	0.0
Remedial Action	6.2	7.8	2.1	0.7	6.0	6.0	6.0	7.0
Subtotal, Environment	15.0	18.1	12.4	21.4	43.9	61.8	10.7	11.2
SAFETY AND HEALTH:								
Base Program	4.3	4.4	4.7	4.9	5.0	5.2	5.3	5.3
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Non-Nuclear	0.3	0.4	0.5	12.8	11.6	15.2	11.3	0.8
Subtotal, Safety and Health	4.6	4.8	5.2	17.7	16.6	20.4	16.6	6.1
TOTAL ES&H	19.6	22.9	17.6	39.1	60.5	82.2	27.3	17.3

NA - Not Applicable

TABLE 2

KANSAS CITY PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste	0	0
Remedial Action	3	5
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	NA	NA
Non-Nuclear	2	3

NA - Not Applicable

TABLE 3

KANSAS CITY PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	5	8
Safety and Health	2	3
Total ES&H	7	11

Appendix
E

SUMMARY OF THE LAWRENCE LIVERMORE NATIONAL LABORATORY ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The mission of the Lawrence Livermore National Laboratory (LLNL), administered by the DOE San Francisco Operations Office, is to be a national resource of science, technical, and engineering capability with special focus on national security. LLNL undertakes those multidisciplinary fundamental and applied research and development activities that are necessary to maintain a leading position in the diverse scientific and technical fields required for this mission. In pursuit of this mission, the Laboratory interacts closely with scientific and technical personnel in universities and industry.

II. KEY AREAS OF ES&H FOCUS

The following are the key areas of focus for ES&H corrective actions at LLNL.

Livermore Groundwater Investigation and Remediation

In 1983, results of tests indicated that volatile organic compounds were present in LLNL wells and several off-site wells. The potential sources include LLNL and the U. S. Navy. LLNL was placed on the National Priority List (Superfund) in July 1987. The remedial investigation will continue through 1989. To date, more than 180 monitoring wells have been installed and sampled; additional monitoring wells and piezometers will be installed in 1988 and 1989. A pilot remedial system for extraction and air stripping of groundwater in the off-site area will begin in 1988. The investigation and pilot studies are to help define the extent of soil and groundwater contamination and to aid in developing cleanup strategies. The project's total estimated cost is $26.4 million and is included in the Remedial Action line in Table 1.

Decontamination/Waste Treatment Facility (DWTF)

The DWTF will replace scattered and outmoded waste treatment and storage facilities with a consolidated complex. The 88,000 square ft. facility is estimated to cost $41.3 million (Table 1, Solid Waste Management) and will be operational in 1992. This expanded capability will allow LLNL to treat a much larger fraction of its radioactive, mixed, and hazardous

waste, thereby reducing escalating off-site disposal costs and reliance on a shrinking number of commercial off-site disposal facilities. Waste operations will be safer, more efficient, and environmentally sound.

The facility will be a fully integrated complex and will include a decontamination and waste treatment building, which will house radioactive decontamination operations, mixed and hazardous aqueous waste treatment equipment, and a rotary-kiln incinerator with state-of-the-art pollution abatement support systems. A depleted uranium oxidation facility and an analytical laboratory are also included.

Sewer Diversion System

LLNL is planning a $1.2 million (Table 1, Water) on-site emergency sewage holding system. To date, LLNL has relied on individual facility wastewater retention systems to contain discharges that threaten to exceed the municipal sewer system discharge limits. With this inadequate system, LLNL has had a number of releases over the years that have resulted in negative publicity, loss of credibility, and expenditures for cleanup at the city facility. On-site diversion capabilities will be built, and the on-site monitoring system will be upgraded to provide greater sensitivity to detection of unplanned releases.

Fire Protection

At the request of DOE, Factory Mutual Research Corporation (FMRC) recently evaluated fire protection at LLNL to determine whether an "improved risk" level of fire protection is met. The primary recommendations cover the addition or modification of automatic fire sprinklers in a number of facilities. A plan of action is being prepared for each FMRC recommendation. The total estimated cost is $2.8 million (Table 1, Non-Nuclear).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Lawrence Livermore National Laboratory. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

Table 3 shows a post 1995 "expected" cleanup estimate of $60 million and a "high" estimate of $300 million. The $60 million assumes each area of groundwater contamination is cleaned up to relevant regulatory action levels. The $300 million assumes that the regulatory agencies require extensive source remediation (e.g., large amounts of soil excavation and off-site disposal in addition to the cleanup of groundwater).

TABLE 1
LAWRENCE LIVERMORE NATIONAL LABORATORY
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	11.0	12.9	14.8	16.6	17.0	12.8	13.2	13.6
Corrective Actions								
Air	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water	0.3	1.6	0.4	0.4	0.4	0.4	0.4	0.4
Solid Waste Management	12.3	12.3	6.8	2.6	0.7	0.7	0.8	0.8
Remedial Action	10.3	10.4	10.5	10.8	10.8	11.1	11.4	11.7
Subtotal, Environment	34.1	37.4	32.7	30.6	29.1	25.2	26.0	26.7
SAFETY AND HEALTH:								
Base Program	24.9	26.2	27.5	29.0	29.8	30.7	31.7	32.6
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
Non-Nuclear	4.0	7.2	1.9	1.6	2.7	1.7	1.8	1.8
Subtotal, Safety and Health	28.9	33.4	29.4	30.6	35.5	32.4	33.5	34.4
TOTAL ES&H	63.0	70.8	62.1	61.2	64.6	57.6	59.5	61.1

NA - Not Applicable

TABLE 2

LAWRENCE LIVERMORE NATIONAL LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	2
Water	0	5
Solid Waste Management	0	5
Remedial Actions	20	50
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

LAWRENCE LIVERMORE NATIONAL LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	60	300
Safety and Health	0	0
Total ES&H	60	300

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Appendix
F

SUMMARY OF THE
LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN
1988

I. SITE MISSION

Los Alamos National Laboratory's primary mission is the research and development of nuclear weapons. Programs include weapons development, nuclear fission and fusion research, nuclear safeguards and security, and verification and control technologies. Basic research in the areas of physics, chemistry, mathematics, engineering, and materials science is integral to Laboratory activities. The facility is administered by the DOE Albuquerque Operations Office.

II. KEY AREAS OF ES&H FOCUS

The following areas have been identified as key areas for projected actions that are important for achieving and maintaining compliance with environment, health, and safety requirements.

Environmental Project Overview

The overriding issues in the environmental areas are the requirements for managing hazardous waste and controlling pollutants in outfalls.

Hazardous Waste Projects

Projects for the treatment, storage, and disposal of current waste and for remedial actions on past waste sites are needed to achieve and maintain compliance with RCRA and CERCLA regulations, and are consistent with sound environmental management principles. Major activities include:

- Testing and removal (as appropriate) of underground storage tanks. ($5.0 million),
- Sampling of wastewater treatment units for possible presence of RCRA regulated substances and remedial action as necessary ($3.9 million),
- Installation of groundwater monitoring and/or further documentation for pursuing a groundwater monitoring waiver at potential waste sites ($10.3 million),

- Construction of several small facilities to improve hazardous and mixed waste handling ($21.0 million),

- Investigation, feasibility studies, and remedial actions, as necessary, for sites covered under the Environmental Restoration Program (TEC ranges from $628 million to $1.8 billion, depending on assumptions about the level of cleanup required by regulators), and

- Response to the requirement to apply off-site transportation requirements to on-site shipments of radioactive and hazardous materials ($18.0 million).

Projects For Outfall Control and Improvement

Spill control and the reduction of possible pollutants in laboratory outfalls are important for addressing the requirements of the Clean Water Act. Major activities include:

- Sanitary Wastewater Consolidation System is an FY88 funded line item designed to replace much of the aging system of wastewater treatment facilities and septic tanks ($16.7 million),

- Industrial outfalls and sanitary outfalls governed by the NPDES permit and by the requirements of a Federal Facility Compliance Agreement between DOE and EPA need improvement ($11.5 million), and

- A plan for preventing and controlling accidental spills has been completed, but implementation is still needed ($3.1 million).

Health and Safety Project Overview

Continued protection of the work force from exposure to radiation, achieving levels as low as reasonable achievable, and from risks of inhalation of potentially hazardous materials are the predominant concern. Responses to new requirements for safety reviews (NAS Report) and for packaging and transporting hazardous materials are additional concerns.

Radiation Protection for Plutonium Operations

Improved radiation protection is important in aging facilities still being used for plutonium operations. In some cases, facilities are being used for operations that they were not originally designed to accommodate. Major activities include:

- Improvements in the current systems for air monitoring ($4.2 million),

- Improvements in the system of air filtering ($19.6 million),

- o Improvements to reduce the need for decontamination ($3.1 million),
- o Improvements in the stack ventilation system ($0.6 million),
- o Improvement in the air system and fume exhaust ventilation project ($1.1 million), and
- o Upgrading in the neutron shielding ($2.1 million).

Ventilation, Exhaust, and Air Filtering Systems

Ventilation and exhaust hoods and air filtering systems need improvements to ensure against undue worker exposure to hazardous and toxic materials or radionuclides. In addition, potential worker exposure to asbestos would be reduced by an expanded asbestos management program. Major activities include:

- o A major overhaul of all such systems ($16.2 million),
- o Improvements in the air filter system of the carcinogen laboratory ($1.3 million), and
- o Asbestos inspections and remedial actions, as necessary ($51.9 million).

Fire Protection Improvements

A fire protection survey of LANL by DOE-HQ independent consultants is planned for LANL in FY 1989.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Los Alamos National Laboratory. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

Where prior studies by DOE, EPA, and the state have indicated no action is necessary, cleanup costs are not included in either the expected or high estimates. Surveillance data taken over several decades does not indicate any off-site transport of contaminants that exceed guidelines or

standards from any LANL Canyon areas. Therefore, no large scale cleanup of any canyons is anticipated. The "high" case includes the assumptions that several small localized cleanups associated with old outfalls will occur.

TABLE 1
LOS ALAMOS NATIONAL LABORATORY
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	14.2	14.7	15.3	15.8	16.2	16.6	17.0	17.4
Corrective Actions								
Air	0.0	0.0	1.4	2.9	2.5	2.3	2.2	2.2
Water	1.0	7.6	6.6	11.4	7.2	4.7	5.8	6.0
Solid Waste Management	3.1	2.0	4.2	12.1	17.3	18.7	33.4	40.0
Remedial Action	2.6	5.8	7.1	17.6	107.1	118.8	118.2	118.0
Subtotal, Environment	20.9	30.1	34.6	59.8	150.3	161.1	176.6	183.6
SAFETY AND HEALTH:								
Base Program	16.3	16.9	17.6	18.1	18.6	19.1	19.5	20.0
Corrective Actions								
Nuclear Reactor	0.0	0.0	0.0	0.9	0.4	0.4	0.4	0.5
Non-Reactor Nuclear	0.0	0.3	0.3	19.1	10.6	15.9	5.6	12.1
Non-Nuclear	0.0	0.0	0.0	10.7	8.1	6.9	18.4	20.0
Subtotal, Safety and Health	16.3	17.2	17.9	48.8	37.7	42.3	43.9	52.6
TOTAL ES&H	37.2	47.3	52.5	108.6	188.0	203.4	220.5	236.2

TABLE 2

LOS ALAMOS NATIONAL LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	8	10
Water	10	12
Solid Waste Management	12	20
Remedial Action	15	20
SAFETY AND HEALTH		
Corrective Actions		
Nuclear Reactor	5	7
Non-Reactor Nuclear	15	20
Non-Nuclear	15	20

TABLE 3

LOS ALAMOS NATIONAL LABORATORY
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	907	1,432
Safety and Health	110	110
Total ES&H	1,017	1,542

Appendix
G

SUMMARY OF THE MID-PACIFIC AREA ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

Between 1946 and 1957, nuclear weapons testing was conducted in the atmosphere at Johnston Atoll and in the Marshall Islands. Because of security, logistical, and cost considerations, the bulk of the testing program conducted in the atmosphere was administered by the DOE Nevada Operations Office. Since 1957, no testing of nuclear weapons has been conducted in the Mid-Pacific region on land under the control of the U.S. Government.(1)

II. KEY AREAS OF ES&H FOCUS

The following have been identified a key areas of focus for ES&H actions at the former nuclear weapons testing sites in the Mid-Pacific area.

Johnston Atoll(2)

This site was, and continues to be, under the control of the Department of Defense (DOD) with the Defense Nuclear Agency as the specific organization responsible. DOD has full responsibility for maintenance of the island, including all ES&H responsibilities. DOD is also responsible for the cleanup of portions of the site contaminated with radionuclides from nuclear weapons testing. Although DOE has no formal responsibility for the decontamination and restoration of these sites, DOE does provide technical advice and support to DOD, as well as a location for waste disposal.

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(1) "Safeguard C" related to the Limited Test Ban Treaty signed in 1963 requires maintenance of the basic capability to resume nuclear weapons testing in the atmosphere should national security needs so dictate.

(2) Under "Safeguard C", if testing of nuclear weapons in the atmosphere is deemed a national requirement, Johnston Atoll would likely be the focus of that activity. In the Interagency Agreement governing this potential testing, DOE has agreed to provide radiological monitoring and support services. The question of final cleanup after such tests is not fully defined.

Marshall Islands

The Marshall Islands are self-governing by virtue of a Compact of Free Association with the United States, finalized through P.L. 99-239. This eliminates their status as a ward of the United States under the 1947 United Nations Trusteeship Agreement. As part of P.L. 99-239, compensation was agreed upon to settle claims arising out of atmospheric tests conducted by the United States at Bikini and Enewetak Atoll between 1946 and 1957. As a result of the testing and the subsequent ecological and human effects, DOE remains involved in four:

- The first is the characterization of the distribution of radionuclides in the environment as a result of earlier atmospheric tests. These data are for the development of the prospective radiation dose model to predict the dose to a returning population. This phase is near completion.

- The second area has been biological and ecological studies regarding the uptake of radionuclides by the local vegetation. The intent of those studies has been to determine if agricultural-type measures could be established that would block or reduce uptake of radionuclides by the local plants. Results of these studies were positive in identifying such measures, and are now being evaluated on a long-term basis. It will be some time before the long-term effectiveness of these efforts can be verified.

- The third area has been the provision of medical services to the people of Rongelap and Utirik Atolls who were exposed to radioactive fallout in 1954 from the BRAVO test.

- The fourth area is the radiation dose validation and bioassay measurements. DOE models have been developed but not validated over the long term. The dose models and their validity potentially could play a critical role in the resettlement issue. Based on these models, the Bikini Atoll Rehabilitation Committee will advise the Congress and the Government of the Marshall Islands as to the habitability of Enjebe Island and Bikini Atoll. The current expectation is that the Bikini Atoll Rehabilitation Committee will advise Congress in April 1988 that the projection of radiation doses to the returning population will fall within international standards and guidelines. The next step will be for the U. S. Government to reach agreement with the Bikinians on rehabilitation of the Atoll. It is further expected, but not ensured, that after FY 1988 there will no longer be a direct responsibility for DOE to conduct and fund this program; however, a scaled-down program may likely be requested and funded by the Republic of the Marshall Islands in the form of U. S. provided technical assistance.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Mid-Pacific Area. The funding levels noted beyond FY 1988 represent the anticipated costs should the United States and the Government of the Marshall Islands not reach agreement.

Tables 1, 2, and 3 present the situation in which sites will be monitored under the environmental base program.

All the Mid-Pacific activities are geared toward resettlement of test atolls, analyses of biological effects of radiation, and future land use by the Marshallese people. This effort has never been one of environmental legislative compliance although cleanups have been done on Enewetak Atoll and Bikini Atoll.

TABLE 1
MID-PACIFIC AREA
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	4.0	4.1	4.3	4.3	4.3	4.3	4.3	4.3
Corrective Actions								
Air	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solid Waste Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Remedial Action	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal, Environment	4.0	4.1	4.3	4.3	4.3	4.3	4.3	4.3
SAFETY AND HEALTH:								
Base Program	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Non-Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Subtotal, Safety and Health	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL ES&H	4.0	4.1	4.3	4.3	4.3	4.3	4.3	4.3

NA - Not Applicable

TABLE 2

MID-PACIFIC AREA
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	0	0
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	NA	NA
Non-Nuclear	NA	NA

NA - Not Applicable

TABLE 3

MID-PACIFIC AREA
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	0	0
Safety and Health	0	0
Total ES&H	0	0

Appendix
H

SUMMARY OF THE MOUND PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

Mound is an integrated research, development, and production facility performing work in support of US DOE weapons and energy programs, with emphasis on explosives and nuclear technology. The facility is administered by the DOE Albuquerque Operations Office.

The Defense Program missions include process development, production engineering, manufacturing, and surveillance of detonators, explosive timers, explosive actuated transducers, explosive pellets, nuclear components, and specific testing equipment.

II. KEY AREAS OF ES&H FOCUS

The following have been identified as the key areas of focus for ES&H actions at Mound.

Hydrogeochemical Investigation

The Buried Valley Aquifer (BVA) in the immediate Mound area is an important water resource. The aquifer system is not completely understood in terms of recharge and movement away from Mound. Oils or hazardous substances and leakage from the storm and sanitary sewer drainage system could potentially contribute to contamination of the BVA. Although there are no known drinking water problems, the proximity of Mound operations to this important water supply necessitates a thorough understanding of the aquifer system.

Planned future actions include geohydrological investigation of the aquifer system in the immediate vicinity of Mound. This investigation will supplement existing geohydrological understanding of the location, direction and rate of movement, and the recharge and discharge of the aquifer system. The investigation will result in sufficient knowledge of the aquifer system such that a ground and surface water monitoring network can be established to detect potential releases of hazardous substances from activities at Mound. In the near term, this investigation will focus on understanding the tritium and organics that have been detected in the ground water.

Isolated Potentially Contaminated Locations

Twenty-one isolated areas have been identified on or near the original Mound site as being contaminated with radioactive materials. These areas are primarily associated with past operational mishaps and equipment failures and were decontaminated under guidelines in existence at the time using the best available technology. Guidelines have become more restrictive since the early 1970s. The isolated contaminated areas have been evaluated as part of several studies including the Mound Site Survey Program, which was initiated in 1982. Information gathered by these studies provided the basis for estimating the cost, timing, and method for removing or stabilizing contaminated soil.

Storm and Sanitary Sewer Drainage Systems

Mound has been operating for over 39 years without a major upgrade of the sanitary and storm sewer system. Facility additions over time have added significantly to the load on these systems. A recent 2-year study by Eastern Utilities Specialists, Inc., pointed to the need for major repairs to the sewer systems in order to limit contaminant discharge due to leakage and infiltration. In addition, several modifications to the storm sewer system are required in order to control the volume of suspended solids in the storm runoff that discharges into the Great Miami River.

Health Physics Calibration Facility

It is the mission of the Health Physics Calibration Facility to ensure that all health physics instruments and dosimeters used in the detection and dose calculation of ionizing radiation be calibrated and recorded so that Mound has traceability to applicable standards and can demonstrate compliance with the Department of Energy Laboratory Accreditation Program (DOELAP). DOELAP must be implemented by all DOE Contractors who provide external, whole-body personnel radiation dosimetry to their employees. DOELAP has two major elements: performance evaluation and research and development of personnel dosimetry. It is the responsibility of the Calibration Facility to expose dosimeter badges with precise dosages of varying types of radiation.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Mound Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

TABLE 1
MOUND PLANT
ES&H RESOURCE PROJECTIONS
(millions of $ in BA)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	4.4	3.6	3.1	3.0	2.8	2.8	2.8	2.8
Corrective Actions								
Air	0.0	1.4	0.3	0.0	0.0	0.0	1.0	2.0
Water	1.8	0.8	3.5	4.7	4.3	3.4	0.0	0.0
Solid Waste Management	0.2	0.7	0.0	0.8	3.9	4.5	0.7	0.0
Remedial Action	1.6	1.2	4.0	2.4	20.0	20.0	20.0	20.0
Subtotal, Environment	8.0	7.7	10.9	10.9	31.0	30.7	24.5	24.8
SAFETY AND HEALTH:								
Base Program	5.3	8.8	8.5	8.3	7.9	8.0	8.1	7.8
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	0.7	0.0	0.0	1.1	3.9	0.0	0.0	0.0
Non-Nuclear	0.0	0.0	0.0	3.3	4.8	3.1	0.0	0.0
Subtotal, Safety and Health	6.0	8.8	8.5	12.7	16.6	11.1	8.1	7.8
TOTAL ES&H	14.0	16.5	19.4	23.6	47.6	41.8	32.6	32.6

NA - Not Applicable

TABLE 2

MOUND PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	2	10
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

MOUND PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	58	78
Health and Safety	0	0
Total ES&H	58	78

Appendix
I

SUMMARY OF THE NEVADA TEST SITE ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Nevada Test Site (NTS), administered by the DOE Nevada Operations Office, is the testing of nuclear weapons. The NTS, covering 1,350 square miles, is located 65 miles northwest of Las Vegas, Nevada. Secondary missions of the NTS are: 1) the disposal of Defense Programs low-level radioactive and mixed waste, 2) the execution of tests involving spills and large quantities of liquefied gases, and 3) the conduct of specialized tests involving radiation and radioactive materials.

II. KEY AREAS OF ES&H FOCUS

The primary focus of ES&H efforts at the NTS is to conduct nuclear weapons testing in a manner that minimizes impact on the environment and does not jeopardize the health and safety of the public or employees. The major activities that are conducted to support these ends include the following.

- Nuclear explosive safety reviews of all devices and supporting equipment and operations,
- Containment Evaluation Panel review of the geologic and hydrologic character of each site and review of the closure of the emplacement hole,
- Strict meteorological criteria and thorough meteorological evaluation as a basis for conducting tests,
- Containing the radioactive materials created as a result of underground detonation of nuclear devices,
- Operation of on-site and off-site radiation sensing devices to detect radioactive materials, and
- Maintenance of emergency plans for staff on-site and the public off-site in case of a release to the atmosphere.

The following have been identified by DOE as the key areas of focus for ES&H corrective actions at the Nevada Test Site.

Remedial Action at Sites Where Surface is Contaminated with Radionuclides and Hazardous Materials from Atmospheric Tests

Test of nuclear devices in the atmosphere dispersed significant quantities of radionuclides and other hazardous materials (beryllium, lead) over large land areas. Sampling and analysis will be done in these areas to evaluate the potential threat of the nonradioactive hazardous materials. Monitoring of the sites for radionuclides will continue. CERCLA assessments will be done, including Hazard Ranking. cleanup will be initiated when an effective method is identified, developed, and proven. Research and development for restoration technology will be continued.

Evaluation of Groundwater Transport of Radionuclides and Hazardous Materials from Underground Weapons Test

Radionuclides and other hazardous materials, released when a nuclear device is detonated underground, are generally captured in the molten rock and contained as it solidifies. With time, however, groundwater in contact with this solidified rock will slowly leach some radionuclides, and they will be transported. The rate, quantity, and composition of this transport is unknown. An extensive program is planned to analyze the chemical and isotopic composition of the groundwater. This program includes plans to construct a sufficient number of monitoring wells, and to develop a model of groundwater flow.

Improvements of Handling, Storage, and Disposal Practices of Hazardous Materials

Hazardous waste, such as solvents, cleaning fluids, and acids, have been discarded into one of the numerous disposed sites and landfills on the Test Site. Corrective actions include the completion of a closure plan and development of operation and maintenance plans for the landfills to prevent similar problems. The existing facility for storage of hazardous waste prior to shipment to approved off-site RCRA facilities is currently inadequate; construction of a suitable facility is scheduled for the fall of 1988. Numerous underground storage tanks are located on the NTS. To be conservative in assessing environmental problems, a fixed percentage of these tanks were assumed to leak. Sampling will be performed to assess the presence and extent of any actual leakage.

Remedial Actions of Sites Where Surface and Potable Waters are Susceptible to Contamination

Industrial waste water, water from tunnels with radioactive materials and small amounts of hazardous materials, and waste water from decontamination stations drain into ditches and waste water lagoons. The ponds are unlined. Contaminated water can be released by percolation through the soil or by overflowing the ditches or lagoons. Permits will be obtained after requirements necessary to bring operations into full environmental compliance are defined.

III. ES&H RESOURCE PROJECTION

The following tables present a summary of the ES&H resource projections for the Nevada Test Site. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "expected" case in Tables 2 and 3 assumes that the NTS would remain closed to public access and would be considered a work area. If DOE decided that it no longer needed the areas for any activity, the land would revert to the control of other Federal agencies.

Environmental conditions at the NTS would be remediated and maintained under the following guidelines:

a. Administrative/living areas. These would be maintained to standards set for conventional populated areas.

b. Occupational/work areas.

(i) For Radiation Hazards. Radiation levels on the NTS will be remediated so that all areas will be open for uncontrolled access (for workers). Radiation levels will be maintained below the occupational limit set for radiation workers (DOE Order 5480.11).

(ii) For Hazardous Materials Hazards. Levels of hazardous materials will be controlled to conditions established by RCRA and CERCLA. This means that the predominance of situations will be corrected by the permitting process.

The environmental conditions at the NTS are benign (limited rainfall/no surface water/high evapotranspiration/great depth to water table), so that there is extremely low potential for transport of radioactive or toxic materials. Consequently, low-level radioactive waste, mixed waste, and hazardous waste will not have to be exhumed from their current disposal sites. Remediation products would be disposed of on the NTS permitted disposal site.

The "high" case estimate allows for a degree of uncertainty such as future availability of data, results of ongoing studies and assessments, and negotiations with regulators.

TABLE 1
NEVADA TEST SITE
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	14.2	13.7	14.5	14.7	14.7	14.7	14.7	14.7
Corrective Actions								
Air	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0.9	1.1	2.9	2.2	4.5	2.2	2.2	2.2
Solid Waste Management	2.7	7.1	4.9	3.4	3.4	3.4	3.4	3.4
Remedial Action	0.3	0.7	2.3	13.6	12.8	30.3	68.5	77.5
Subtotal, Environment	18.1	22.6	24.6	33.9	35.4	50.6	88.8	97.8
SAFETY AND HEALTH:								
Base Program	29.7	31.8	32.2	31.9	32.5	33.0	31.8	31.8
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Non-Nuclear	2.2	2.1	0.8	0.9	0.9	0.1	0.0	0.0
Subtotal, Safety and Health	31.9	33.9	33.1	32.9	33.5	33.2	31.9	31.9
TOTAL ES&H	50.0	56.5	57.7	66.8	68.9	83.8	120.7	129.7

NA - Not Applicable

TABLE 2

NEVADA TEST SITE
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	7
Solid Waste Management	2	17
Remedial Action	7	27
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

NEVADA TEST SITE
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	250	750
Safety and Health	0	0
Total ES&H	250	750

Appendix
J

SUMMARY OF THE OAK RIDGE, Y-12 PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The Oak Ridge Y-12 Plant, managed by Martin Marietta Energy Systems, Inc., and administered by the DOE Oak Ridge Operations Office, has progressed from its original single mission of electromagnetic uranium separation in 1943 to having the following present day, primary missions:

- o Production of nuclear weapon components,
- o Fabrication support to Department of Energy weapon design laboratories,
- o Processing of source and special nuclear material,
- o Support for Oak Ridge National Laboratory facilities and Martin Marietta Energy Systems General Staff located at the Y-12 Plant site, and
- o Support for other government agencies.

II. KEY AREAS OF ES&H FOCUS

The Department of Energy (DOE) has identified the following as key areas for future Environmental, Safety, and Health activities at the Y-12 Plant.

Improvement of the Quality and Reduction in the Quantity of Y-12 Plant Effluents

Improvement of the quality and reduction in the quantity of Y-12 Plant effluents has been the major focus of environmental activities at the Y-12 Plant since 1983. Included are the construction and operation of major emission control projects, waste treatment, storage and disposal facilities, construction and upgrade of effluent monitoring capabilities, and establishment of an administrative program to ensure proper functioning of these facilities and compliance with environmental regulations. Major proposed line item projects are listed below. Among these projects, the Steam Plant Ash Disposal Facility will be needed to

attain compliance with State of Tennessee water quality requirements, while the remaining projects will be constructed to maintain compliance with applicable regulations.

- Steam Plant Ash Disposal Facility ($12.8 million),
- Production Waste Storage Facility ($25.0 million),
- Sanitary Wastewater Treatment Facility ($25.0 million),
- Non-Rad Emission Control and Monitoring Improvements ($16.5 million), and
- Stack Emission Reduction and Monitoring ($17.6 million).

Remediation of Surface Impoundments, Landfills, and Off-Site Contamination

Preparation for and planning of remedial activities at the Y-12 Plant has been underway since 1983. Site identification, characterization, remedial investigation, feasibility study preparation, conceptual design, and facility closure/remediation are in various stages of implementation at Y-12 Plant sites. Major current and proposed remediation initiatives are:

- Closure and Post-Closure Activities, Including the Bear Creek Waste Disposal Areas ($165.0 million),
- East Fork Poplar Creek Cleanup ($45.0 million), and
- Remedial Investigation of Solid Waste Management Units ($20.0 million).

Analysis, Documentation, and Correction of Worker Safety Concerns

A number of special studies have been conducted over the last several years directed toward assessing surfacing vulnerabilities and associated operating risks related to worker safety. Completion of all existing facility safety analyses and documentation is underway. Improvements to building structures, fire protection upgrades, and upgrade of electrical equipment are safety areas where substantial funds will be used for improvement in worker protection. Major proposed safety projects include:

- Fire Protection Upgrade ($8.5 million),
- Electrical Equipment Replacements ($4.0 million), and
- Building Structural Restorations ($3.3 million).

Reduction of Worker Exposure to Airborne Contaminants

Strong programs are in place for respiratory protection from uranium and non-uranium exposures; medical surveillance for uranium, beryllium, and asbestos workers; and fitness support for the Y-12 guard force. Major proposed improvement projects include:

- Ventilation Systems Restoration ($60.0 million),
- Personnel Radiation Monitoring Laboratory ($1.3 million), and
- Uranium Contamination Containment and Control Improvements ($74.0 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projections for the Y-12 Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The remedial action strategy on-site assumes in situ stabilization of the majority of disposed wastes coupled with groundwater remediation where necessary, and off-site, the selected removal of contamination to meet criteria yet to be established. The difference between the "expected" and "high" number of years projections provided in Table 2 is due principally to the uncertainties in the length of time that will be required to complete groundwater remediation. The difference between the "expected" and "high" dollar projections presented in Table 3 is due to uncertainties in the scope of the actual efforts that will be required. In most of the Bear Creek disposal areas, closure without waste removal is expected; the high projection assumes limited removals of certain waste types, for example, pyrophoric materials. For the East Fork Poplar Creek area expected case, removal of soils contaminated with mercury above 100 parts per million was assumed; for the high case, a more restrictive criterion of 50 parts per million was assumed.

Resource projections to comply with increased radiation contamination control requirements are included in the safety and health category. While capital projects may need to be restructured, total resource requirements to comply with increased control requirements are included.

TABLE 1
OAK RIDGE Y-12 PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	37.0	39.0	40.0	45.0	45.0	48.0	48.0	48.0
Corrective Actions								
Air	3.0	1.0	1.0	1.0	3.0	4.0	6.0	4.0
Water	6.0	6.0	4.0	1.0	0.0	5.0	8.0	8.0
Solid Waste Management	3.0	1.0	9.0	7.0	5.0	0.0	5.0	5.0
Remedial Action	22.0	31.0	39.0	37.0	38.0	35.0	34.0	30.0
Subtotal, Environment	71.0	78.0	93.0	91.0	91.0	92.0	101.0	95.0
SAFETY AND HEALTH:								
Base Program	21.0	24.2	27.2	32.2	34.2	34.2	37.0	37.0
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	6.0	7.0	7.0	12.0	15.0	15.0	20.0	18.0
Non-Nuclear	11.0	27.0	46.0	27.0	22.0	26.0	19.0	19.0
Subtotal, Safety and Health	38.0	58.2	80.2	71.2	71.2	75.2	76.0	74.0
TOTAL ES&H	109.0	136.2	173.2	162.2	162.2	167.2	177.0	169.0

NA - Not Applicable

TABLE 2

OAK RIDGE, Y-12 PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	3	15
Water	6	15
Solid Waste Management(1)	2	15
Remedial Action	10	50
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	2	5
Non-Nuclear	3	10

(1) This excludes low-level radioactive waste treatment, storage, and disposal considerations.

NA - Not Applicable

TABLE 3

OAK RIDGE, Y-12 PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	290	530
Safety and Health	50	150
Total ES&H	340	680

Appendix
K

SUMMARY OF THE PANTEX PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Pantex Plant, administered by the DOE Albuquerque Operations Office, is the production of nuclear weapons and the evaluation, maintenance, and eventual disposal of nuclear weapons in the United States stockpile.

II. KEY AREAS OF ES&H FOCUS

The following have been identified at the Pantex Plant as the key areas of focus for ES&H corrective actions.

Handling, Staging and Disposal of Plant Waste Products

Compliance with EPA and State of Texas regulations concerning the discharge of hazardous chemicals is a major ES&H objective at the Pantex Plant. Waste products of primary concern are explosives, solvents, weapon material from retirement activities, test-fire debris, and sanitary sewage waste. Following is a summary of the major project initiatives directed at the accomplishment of this objective:

- Hazardous Waste Treatment and Processing Facility ($19.0 million),
- High Explosive Incinerator ($9.0 million), and
- Related General Plant Projects ($8.7 million)

Explosive Operations Facilities

Many of the explosive operations facilities at the Pantex Plant were constructed 30-40 years ago and therefore, do not meet the more stringent Class I (high accident potential) and Class II (moderate accident potential) requirements of the DOE Explosive Safety Manual (DOE/EV 06194). Following is a summary of the major projects identified to correct this deficiency:

- o High Explosive Formulation Facility ($77.0 million),
- o Assembly Bay Door Fragment Shields ($2.3 million),
- o Accelerated Material/Weapons Aging Facility ($30.6 million),
- o Production HE Pressing and Small Component Fabrication Facility ($25.0 million), and
- o Related General Plant Projects ($1.52 million).

Employee Health Measures

The ES&H objectives for the Pantex Plant include full compliance with DOE regulations concerning human health and safety. While the Pantex Plant has a strong program in this area, the following projects have been identified to strengthen the capabilities for managing the industrial hygiene & health physics programs:

- o Industrial Hygiene Laboratory ($0.7 million),
- o Occupational Health Computer Equipment ($0.4 million),
- o Personnel Radiation Monitoring & Calibration Facility ($2.0 million), and
- o Metrology Radiation Calibration Facility ($1.2 million).

Fire Protection System

The following fire protection upgrades have been identified to assure that potential health and safety hazards are controlled so they continue to meet applicable DOE and NEPA Life Safety Code requirements for protection of employees and the public:

- o Fire Alarm System Equipment & Modification ($0.2 million),
- o Fire Protection Upgrade ($6.5 million),
- o Fire Protection for MAA Ramps ($0.5 million).

Emergency Preparedness

The following projects have been identified to provide necessary capabilities for complying with current DOE requirements for emergency preparedness:

- o Public Address System Upgrade ($0.4 million), and
- o EOC/Central Fire Station ($6.9 million).

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III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Pantex Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

Where prior studies by DOE, EPA, and the state have indicated no action is necessary, cleanup costs are not included in either the "expected" or "high" estimates. Based on soil and hydrology conditions, it is assumed the groundwater under the twenty-six landfills is not contaminated. Therefore, no groundwater cleanup treatment is assumed.

TABLE 1
PANTEX PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8
Corrective Actions								
Air	0.2	0.5	0.5	0.4	0.5	0.5	0.5	0.5
Water	0.2	0.6	0.6	0.5	0.6	0.6	0.6	0.6
Solid Waste Management	1.4	3.6	1.8	1.8	17.8	1.4	18.8	9.5
Remedial Action	2.5	2.5	2.9	6.3	40.2	50.2	50.2	50.2
Subtotal, Environment	4.9	7.9	6.5	9.8	59.9	53.5	70.9	61.6
SAFETY AND HEALTH:								
Base Program	5.5	5.8	6.2	6.5	6.7	6.8	7.0	7.1
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Non-Nuclear	2.6	5.8	8.1	8.4	15.2	9.1	86.2	42.9
Subtotal, Safety and Health	8.1	11.6	14.3	14.9	21.9	15.9	93.2	50.0
TOTAL ES&H	13.0	19.5	20.8	24.7	81.8	69.4	164.1	111.6

NA - Not Applicable

TABLE 2

PANTEX PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	5	10
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	NA	NA
Non-Nuclear	7	10

NA - Not Applicable

TABLE 3

PANTEX PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	104	155
Safety and Health	80	80
Total ES&H	184	235

Appendix
L

SUMMARY OF THE PINELLAS PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Pinellas Plant, located in Largo, Florida, and administered by the DOE Albuquerque Operations Office, is the development and manufacture of special electronic and mechanical nuclear weapons components. Although the neutron generator remains the primary product, the Plant's mission has expanded to include the manufacture of radioisotopically-powered thermoelectric generators (RTGs), specialty capacitors, thermal batteries and ambient battery packs, crystal resonators, neutron detectors, lightning arrester connectors, vacuum switch tubes, headers, and magnetic devices.

II. KEY AREAS OF ES&H FOCUS

The following have been identified by DOE as the key areas of focus for ES&H corrective actions at the Pinellas Plant.

Remedial Actions of Waste Sites

Remedial Action activities are currently limited to two (2) hazardous waste sites discovered in 1985 and 1986. Contamination was the result of hazardous wastes being stored in sealed 55-gallon drums and ultimately being buried on site over twenty years ago. Source material (drums) were removed in 1985.

Cleanup of the sites is expected through 1992 and is currently on schedule. To date, one site has progressed to the Remedial Action/Clean Up phase while the other site is at the Feasibility Study phase.

Total estimated cost (TEC) for remediation of these two waste sites is $2,400,000.

Several additional potential CERCLA sites have been identified. The TEC for assessment and corrective action for these sites is $23,000,000.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Pinellas Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

TABLE 1
PINELLAS PLANT
ES&H RESOURCE PROJECTIONS
(millions of $ in BA)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	0.8	0.8	0.8	1.1	1.1	1.1	1.1	1.2
Corrective Actions								
Air	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Water	0.0	0.0	0.5	0.4	0.5	0.0	0.0	0.0
Solid Waste Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Remedial Action	1.4	0.8	0.4	0.4	4.2	4.0	4.0	1.0
Subtotal, Environment	2.2	1.6	1.7	2.6	5.8	5.1	5.1	2.2
SAFETY AND HEALTH:								
Base Program	1.6	1.7	1.5	1.6	1.7	1.7	1.8	1.9
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Nuclear	0.4	0.7	0.3	1.2	0.0	0.0	0.0	0.0
Subtotal, Safety and Health	2.0	2.4	1.8	2.8	1.7	1.7	1.8	1.9
TOTAL ES&H	4.2	4.0	3.5	5.4	7.5	6.8	6.9	4.1

NA - Not Applicable

TABLE 2

PINELLAS PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	2	2
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

PINELLAS PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	9	9
Safety and Health	0	0
Total ES&H	9	9

Appendix
M

SUMMARY OF THE RESIDUAL NUCLEAR EXPLOSIVE SITES 1988

I. SITE MISSION

Currently, the DOE Nevada Operations Office (NV) has caretaker responsibilities for eight locations where underground nuclear explosives were detonated as part of defense-related tests and peaceful applications development (the Plowshare Program). The sites under the care of NV include the following:

Test Name	Location of Site	Date of Test
	DEFENSE-RELATED	
Shoal	Fallon, NV	10/26/63
Salmon	Tatum Dome/Hattiesburg, MS	10/22/64
Long Shot	Amchitka, AK	10/29/65
Sterling	Tatum Dome/Hattiesburg, MS	12/03/66
Faultless	Central Nevada	01/19/68
Milrow	Amchitka, AK	10/02/69
Cannikin	Amchitka, AK	11/06/71
	PLOWSHARE PROGRAM	
Gnome	Carlsbad, NM	12/10/61
Gasbuggy	Farmington, NM	12/10/67
Rulison	Grand Valley, CO	09/10/69
Rio Blanco	Rifle, CO	05/17/73

At this time there are no planned or anticipated future missions for these sites; however, options have remained open for execution of additional underground tests at Amchitka, if required.

II. KEY AREAS OF ES&H FOCUS

The key focus of the ES&H activities at these sites is the monitoring of water samples to determine if radioactive materials are escaping from the shot cavity into the groundwater. Samples are generally taken on an annual basis. If these sites show concentrations of radionuclides above allowable limits, then DOE is required to take remedial actions. At this time, monitoring data provides no indication that such actions will be required. The Department will conduct specific studies for each of the sites. These studies will be similar to the remedial investigation and feasibility studies and will formally outline and document appropriate corrective actions.

Sampling surveys for nonradioactive contaminants have been conducted at the sites. Chromium was detected in the mud pit area at concentrations (8mg/l) in excess of the allowable limit (5mg/l) at the Central Nevada Test Site. Approximately 10,000cu yards of residual drilling mud is involved. The potential hazard of this situation is extremely low, and no project has yet been developed to resolve the problem. Tritium has been measured in an aquifer of nonpotable water above and on the surface at Tatum Dome, although it is within the limits considered to be safe. Pursuant to the completion of the site-specific evaluation for Tatum Dome, some remedial action may be required.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the residual nuclear explosive sites. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "expected" case in Tables 2 and 3 assumes that all sites will be cleaned up to allow unrestricted access by the public to the area. A thorough evaluation of each site will be conducted and formally documented. Surface cleanup of any residual material, if required, will be completed. Monitoring wells will be installed in a configuration specified by the Environmental Protection Agency for Comprehensive Environmental Response, Compensation and Liability Act sites (one up gradient and two down gradient).

The "high" case assumes exactly the same programmatic actions as the expected case; the cost of individual actions in the "high" case is assumed to be double the expected case to allow for uncertainties such as future availability of data, results of ongoing studies and assessments, and negotiations with regulators.

TABLE 1
RESIDUAL NUCLEAR EXPLOSIVE SITES
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Corrective Actions								
Air	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solid Waste Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Remedial Action	0.0	0.2	0.1	0.3	1.8	1.0	5.0	0.0
Subtotal, Environment	0.2	0.4	0.3	0.5	2.0	1.2	5.2	0.2
SAFETY AND HEALTH:								
Base Program	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Non-Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Subtotal, Safety and Health	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL ES&H	0.2	0.4	0.3	0.5	2.0	1.2	5.2	0.2

NA - Not Applicable

TABLE 2

RESIDUAL NUCLEAR EXPLOSIVE SITES
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	0	0
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	NA	NA
Non-Nuclear	NA	NA

NA - Not Applicable

TABLE 3

RESIDUAL NUCLEAR EXPLOSIVE SITES
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	0	0
Safety and Health	N/A	N/A
Total ES&H	0	0

Appendix
N

SUMMARY OF THE ROCKY FLATS PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Rocky Flats Plant, administered by the DOE Albuquerque Operations Office, is to produce components directly related to national defense. The plant is involved in fabricating components from plutonium, uranium, beryllium, and stainless steel. Production activities include metal fabrication and assembly, chemical recovery and purification of process-produced transuranic radionuclides, and related quality control functions.

II. KEY AREAS OF ES&H FOCUS

The following have been identified by DOE as key areas of focus of ES&H corrective actions at the Rocky Flats Plant.

Improvement of ES&H Quality Program

Development and implementation of an enhanced ES&H Quality Program is underway at the plant. The existing Quality Program Plan is being revised; a new ES&H Requirements/Procedures Manual is being written. QA officers have been trained and approved plans/schedules for the implementation of the new Program have been agreed upon with each functional group.

Improve the Radiation Safety Program

The Comprehensive Plan for Radiation Safety at the Rocky Flats Plant has been completely revised. Development and implementation of requirements and procedures that upgrade Plant standards and practices for radiation protection will be accomplished by the 3rd Quarter of FY 1988.

Significant improvements are underway for improved contamination control. Radiation protection procedures are being upgraded to include more specific requirements for control, reduction, containment, decontamination and general housekeeping in Buildings 707, 771, 776, 777 and 779. Currently, the plan for these improvements has been written and implementation has begun.

Also being developed and implemented are upgraded policies, requirements and procedures for a rem-reduction program that provides more rigorous practices than those currently in effect. This program will continue to improve performance in support of ALARA.

Improved radiation worker training will be developed and conducted. Full compliance with the training portion of DOE Order 5480.11 will be achieved by March 1989.

Examples of line item construction projects identified to implement radiation protection improvements at the Plant include:

- Personnel Radiation Monitoring & Control to provide a new calibration facility for radiation detection equipment (FY 1988, 1989: $2.7 million),

- Health/Environment Compliance Projects to provide new selective alpha air monitoring systems for 7 production buildings, a complete replacement of the on and off-site ambient air monitoring network, new isokinetic effluent air samplers for production buildings, and a new criticality alarm display and data storage system (FY 1992, 1993: $26.2 million),

- In addition to the above line items, $1,870,000 is projected in the Plant Basic Capital Equipment budgets for FY 1989 and FY 1990 to completely replace all fixed radiation detector heads in all production buildings. FY 1989 Basic Capital Equipment budget requests for radiation safety-related items total $3,452,000.

Remedial Actions - RCRA Part B Permit Application

During 1987, the RCRA/CERCLA Program Office was formed at the Plant to coordinate the Rocky Flats Plant efforts to comply with RCRA/CERCLA regulations and the DOE, EPA, State of Colorado Compliance Agreement. This program was formed to respond to the increased stringency of the RCRA/CERCLA compliance schedule, increased regulatory authority, changed regulations, and rapidly expanding legal and technical requirements. Major aspects of the RCRA/CERCLA compliance program are project management, permit application modification, regulatory implementation, remedial investigation feasibility studies, closure activities, and waste minimization activities.

Examples of line item construction projects identified to pursue remedial actions include:

- Sanitary Landfill Closure (FY 1992: $3.9 million),

- Corrective Action, Hillside & 904 Pad (FY 1991, FY 1992, and Beyond: $11.2 million),

- o Remove Underground Piping (FY 1992, FY 1993, FY 1994, and Beyond: $31.2 million), and

- o Saltcrete/Pondcrete Disposal (11,000 blocks in storage--DOE/EPA/State agree to NTS storage--1 year to slip).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Rocky Flats Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

Where prior studies by DOE, EPA, and the state have indicated no action is necessary, cleanup costs are not included in either the "expected" or "high" estimates. Based on studies conducted from the mid-1970s to early 1980s, off-site plutonium and americium levels are below any actual or proposed regulatory levels. Therefore, no cleanup costs have been estimated for the Great Western Reservoir, Standley Lake, and some land surface east of the Rocky Flats Plant.

TABLE 1
ROCKY FLATS PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	4.0	4.1	4.3	4.0	4.0	5.0	5.0	5.0
Corrective Actions								
Air	0.0	0.0	0.0	0.0	2.4	19.0	0.7	5.4
Water	0.0	10.2	0.0	8.7	0.5	0.0	0.0	0.0
Solid Waste Management	10.0	11.4	6.5	4.5	7.2	3.9	4.0	4.0
Remedial Action	6.7	11.8	13.0	27.7	45.6	42.6	33.7	43.6
Subtotal, Environment	20.7	37.5	23.8	44.9	59.7	70.5	43.4	58.0
SAFETY AND HEALTH:								
Base Program	21.6	26.6	23.9	25.7	24.6	24.6	24.6	24.6
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	1.7	2.4	0.0	0.0	0.5	4.3	0.0	0.0
Non-Nuclear	1.4	1.3	2.5	1.9	1.1	1.4	1.4	0.9
Subtotal, Safety and Health	24.7	30.3	26.4	27.6	26.2	30.3	26.0	25.5
TOTAL ES&H	45.4	67.8	50.2	72.5	85.9	100.8	69.4	83.5

NA - Not Applicable

TABLE 2

ROCKY FLATS PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	8	15
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

ROCKY FLATS PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	120	180
Safety and Health	0	0
Total ES&H	120	180

Appendix
O

SUMMARY OF THE SANDIA NATIONAL LABORATORIES/ALBUQUERQUE ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of Sandia National Laboratories/Albuquerque (SNLA) is national security, with principal emphasis on nuclear weapon development and engineering.

II. KEY AREAS OF ES&H FOCUS

The following have been identified by DOE as the key areas of focus of ES&H corrective actions.

Upgrading Operations of Reactor Facilities

The most significant issues associated with the reactor facilities are erosion of the technical support base directly related to operations and compliance activities, the overcrowding and congestion within the confines of the area where the reactors are located, and modernization of some facilities and systems. Examples of projects identified to upgrade the operations of the reactor facilities include:

- Move Non-Reactor Personnel from Reactor Facility Area ($1.5 million),
- Implement Nuclear Facility Action Plan ($0.9 million),
- Enhance Personnel Dose Reduction Program ($1.0 million), and
- Enhance Reactor Technical Support ($0.3 million).

Replacing/Retrofilling PCB Transformers

While EPA regulations promulgated under the Toxic Substance Control Act (TSCA) allow the continued use of PCB transformers, such transformers are being replaced or retrofilled to minimize environmental and health hazards, especially those which may arise from fires involving PCB transformers. Examples of projects identified to replace or retrofill PCB transformers are:

- o Retrofill PCB Transformers ($0.7 million),
- o Replace PCB Transformers ($1.2 million), and
- o Replace PCB Light Ballasts ($0.5 million).

Mixed Waste Compliance With Hazardous Waste Regulations

EPA recently decided that mixed waste management will become subject to the requirements of the Resource Conservation and Recovery Act (RCRA) no later than July 1, 1989. Examples of projects identified to bring mixed waste management into compliance with RCRA include:

- o Construction of a Mixed Waste Facility ($1.2 million),
- o Off-Site Disposal of Mixed Waste (Annual Cost $0.5 million), and
- o Additional Staff to Manage Mixed Waste (Annual Cost $0.1 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Sandia National Laboratories/Albuquerque. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

TABLE 1
SANDIA NATIONAL LABORATORIES/ALBUQUERQUE
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	1.5	2.7	3.0	3.1	3.2	3.3	3.4	3.5
Corrective Actions								
Air	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solid Waste Management	2.3	0.7	0.2	0.0	0.1	0.0	0.0	0.0
Remedial Action	1.7	2.5	3.7	4.8	23.1	27.4	27.1	24.8
Subtotal, Environment	6.3	5.9	6.9	7.9	26.4	30.7	30.5	28.3
SAFETY AND HEALTH:								
Base Program	8.0	8.5	8.9	9.2	9.4	9.6	9.9	10.0
Corrective Actions								
Nuclear Reactor	0.5	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Non-Reactor Nuclear	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.0
Non-Nuclear	0.6	2.1	1.9	1.4	1.1	1.0	1.0	1.0
Subtotal, Safety and Health	9.1	14.4	11.8	10.6	10.5	10.6	10.9	11.0
TOTAL ES&H	15.4	20.3	18.7	18.5	36.9	41.3	41.4	39.3

TABLE 2

SANDIA NATIONAL LABORATORIES/ALBUQUERQUE
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	5	13
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	0	0
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

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TABLE 3

SANDIA NATIONAL LABORATORIES/ALBUQUERQUE
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	55	70
Safety and Health	0	0
Total ES&H	55	70

Appendix
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SUMMARY OF THE SANDIA NATIONAL LABORATORIES/LIVERMORE ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of Sandia National Laboratories/Livermore (SNLL) is national security, with principal emphasis on nuclear weapon development and engineering.

II. KEY AREAS OF ES&H FOCUS

The following have been identified by DOE as the key areas of focus of ES&H corrective actions.

Upgrading Operations at Tritium Research Laboratory

DOE internal directives establish standards for worker, public, and environmental protection from ionizing radiation. In addition to keeping radiation doses below specified limits, it is DOE policy to maintain exposures at As Low As Reasonably Achievable (ALARA) levels. Upgrading and modernizing equipment and procedures at the TRL will assure continued compliance with DOE standards and DOE's ALARA philosophy. Examples of projects identified to upgrade and modernize equipment and procedures at the TRL include:

- Gas Purification System Replacement ($0.4 million),
- Tritium Monitor System Replacement ($0.8 million),
- Tritium Assay Station Replacement ($0.6 million),
- Replace Metal Tritide Beds ($0.4 million), and
- Purchase Tritium ALM-1 Calorimeter ($0.3 million).

Compliance Activities, Upgrades, and Actions

Several actions are necessary to assure compliance with evolving environmental requirements; to assure the health and safety of employees, the public, and the environment; and to assure that concerns and findings of various appraisals are appropriately addressed. Typical activities include:

- o Asbestos Sampling and Removal ($0.2 million),
- o Upgrade Hazardous Waste Facility ($0.2 million) (Annual Cost $0.7 million),
- o Upgrade Liquid Effluent Control and Sewer Sampling Capabilities (Annual Cost $0.1 million),
- o Upgrade Emergency Preparedness, Training, QA Program, Etc. (Annual Cost $0.1-$0.2 million, and
- o Additional Contract Staff for ES&H Activities (Annual Cost $0.2 million).

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Sandia National Laboratories/Livermore. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The "high" case in Tables 2 and 3 represents a situation where the "expected" case alternative is not acceptable to the regulators. This case assumes more release sites will have to be cleaned up and cleanup is near background levels. This case does not assume that all hazardous waste is exhumed from the facility.

TABLE 1
SANDIA NATIONAL LABORATORIES/LIVERMORE
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	1.6	1.1	1.0	1.0	1.0	1.0	1.1	1.1
Corrective Actions								
Air	0.3	0.4	0.0	0.1	0.0	0.0	0.0	0.0
Water	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Solid Waste Management	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Remedial Action	0.4	0.6	0.5	0.5	0.2	0.2	0.2	0.2
Subtotal, Environment	2.5	2.2	1.5	1.6	1.3	1.2	1.3	1.3
SAFETY AND HEALTH:								
Base Program	1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.8
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	0.3	0.0	0.9	1.4	0.5	0.0	0.0	0.0
Non-Nuclear	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal, Safety and Health	1.9	1.5	2.4	3.0	2.1	1.6	1.7	1.8
TOTAL ES&H	4.4	3.7	3.9	4.6	3.4	2.8	3.0	3.1

NA - Not Applicable

TABLE 2

SANDIA NATIONAL LABORATORIES/LIVERMORE
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	0	0
Water	0	0
Solid Waste Management	0	0
Remedial Action	7	10
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	0
Non-Nuclear	0	0

NA - Not Applicable

TABLE 3

SANDIA NATIONAL LABORATORIES/LIVERMORE
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	1	3
Safety and Health	0	0
Total ES&H	1	3

Appendix
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SUMMARY OF THE SAVANNAH RIVER PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Savannah River Plant, administered by the DOE Savannah River Operations Office, is to produce materials for the nation's defense. The major products are tritium, plutonium-239, and highly enriched uranium. In addition, plutonium-238 is produced as required for radioisotopic thermal generators. Cobalt-60, plutonium-242, and transplutonium isotopes are produced on an infrequent basis. With the startup of the Defense Waste Processing Facility (DWPF) in 1990, the site will begin immobilizing high-level radioactive waste with a borosilicate glass matrix for disposal in a geologic repository.

II. KEY AREAS OF ES&H FOCUS

The following have been identified by DOE as the key areas of focus for ES&H corrective actions at the Savannah River Site.

Enhanced Reactor Safety

The Department of Energy has established requirements for nuclear reactor safety programs. The following construction projects will enhance nuclear/process safety by: 1) improving safety equipment and capability, and 2) improving emergency response capability.

- Fourth Additional System, ECS ($5.6 million),
- Improved Reactors Modifications for Seismic Protection ($10.0 million),
- Reactor Area Modification for Seismic Protection ($5.0 million),
- Replace Reactor Process Pump and Motor Lube Systems ($5.9 million),
- Emergency Diesel Generator Reliability ($12.5 million),
- Extend Reactor Area Diesel Engine Operations ($36.5 million),
- Reactor Electrical Distribution System ($21.0 million),

- Reactor Flood Control Pumps ($15.0 million),
- Reactor Operations Monitoring System ($42.0 million),
- Improved Reactor Spray System, First Area ($43.0 million),
- Improved Reactor Spray System, Second Area ($50.0 million), and
- Moderator Recovery System ($9.1 million).

Improved Fire Protection

The emphasis for meeting fire protection objectives at Savannah River has been on fire prevention. The DOE philosophy is to provide engineered fire protection, in addition to fire prevention, where the loss potential exceeds established criteria. The strategy for meeting this philosophy includes the following projects:

- Replace Fire Protection Computer ($0.4 million),
- Provide 100-Area Fire Station ($1.1 million),
- Fire Truck for 100-Area Fire Station ($0.4 million),
- Fire Detection Upgrades ($5.0 million),
- Replace Cork Insulation on Ventilation Ducts ($0.3 million),
- Redesign Halon System, 221- FB-Line ($1.0 million),
- Reactor Standpipe Hose Stations ($1.1 million),
- Plantwide Fire Protection, Phase I ($80.0 million), and
- Plantwide Fire Protection, Phase II ($120.0 million).

RCRA Compliance/Groundwater Protection

The Department of Energy policy is to protect the environment while conducting production operations. The environmental programs at Savannah River encompass all of the environmental media. RCRA/CERCLA compliance and groundwater protection are major items of concern. The following construction projects and closure activities should ensure RCRA compliance and groundwater protection:

- F/H Effluent Treatment Facility ($50.0 million),
- Consolidated Incinerator ($47.0 million),
- Hazardous/Mixed Waste Disposal Facility ($22.0 million),

- o Mixed Waste Management Facility Closure ($53.0 million),
- o F/H Seepage Basin Closure (approximately $70.0 million),
- o Old Low-Level Radioactive Burial Ground Closure ($80.0 million),
- o M-Area Settling Basin Closure ($3.6 million), and
- o A/M Area Groundwater Remediation (approximately $3.0 million/year).

In addition, $100.0 million is needed for a recirculating cooling tower to mitigate hot water discharges from K Reactor.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Savannah River Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

Regarding the cost and time estimates provided in Tables 2 and 3, the "expected" case values reflect the best estimate, at this time, for what will be required for closure of waste sites. Consistent with the negotiations and discussions to date with regulators, the expected closures consist, largely, of a combination of strategies that rely heavily on remediation with clay caps, barriers and actions to mitigate the migration of contamination, along with extensive monitoring and surveillance. Some in situ stabilization will be done, at some sites, prior to capping. Likewise, some of the sites will require little or no stabilization, and may only be backfilled and monitored (usually with one or more shallow groundwater wells) to achieve a closure consistent with current regulations.

The currently expected time frames for closure of existing waste sites do not typically extend beyond 1995 in the current long range plans and the expected times to achieve compliance reflect a few longer range projects rather than waste site closures.

The "expected" costs and times for the post FY 1995 time frame reflect closure methods and conditions following closure that most closely match the situation described in the "preferred option" for the Groundwater Protection EIS (DOE/EIS-0120), wherein a combination of strategies will be used to achieve closure. It is significant to note that the EIS combination strategy (preferred option) only involved excavation of two sites and the presumption was that no ill effects would occur to a population living at the site at some future time.

The EIS evaluated the contaminants present at each site, their magnitude and concentration, characteristics of migration and health effects and then mathematically modeled the movements and effects of the contaminants. The EIS assumes closures approximating the strategy of

capping and mitigation now seen to be likely and evaluates risk to an on-site population with the site becoming uncontrolled and reverting to agricultural use, following an assumed 100 year institutional control period. This population would farm the land, use the groundwater, and reside in homes on the actual closed waste sites. Since the end condition in the expected case approximates this combination strategy, and no significant risks to a resident population exist, then the closures consisting largely of capping and limited mitigation (rather than excavation) can presumably be defended as the most likely case. We believe these expectations have been supported by approval of closure plans by the South Carolina Department of Health and Environmental Control for the Mixed Waste Management Facility, the M-Area Hazardous Waste Management Facility, and the Chemical, Metal, and Pesticides Pits.

The "high" times and values reflect estimation, often at the high spot level, of what would be required for waste removal, exhumation, treatment and/or volume reduction, capping the old site, and some final disposition of the waste removed. Excavation, exhumation and waste removal type closures, followed by remediation, such as capping, are similar to the basis for the total elimination case in the referenced EIS.

In the event a major change in the laws occurs, total excavation could be required for all waste sites. The costs for exhuming and redisposing of material from the contaminated streams and swamps would be orders of magnitude larger than reflected in the "High" case column. SR believes that such cleanup would be infeasible, unwarranted, and result in significant public health and environmental impacts. Such an effort would be infeasible because it would require dewatering approximately 10000 acres and the subsequent removal of material to a depth of approximately two feet. It is unwarranted because the radionuclides are stabilized in the sediments. Removal would reintroduce them into the environment and potentially cause an adverse impact on public health. It would result in an adverse environmental impact on an extremely valuable and productive cypress-tupelo swamp system and its indigenous fish and wildlife populations and endangered species by removing and essentially destroying the area. These additional costs are not included in this report.

Ongoing evaluations of SRP facilities continue to reveal new and/or increasing safety and health upgrade areas. In addition to these upgrade areas, it is probable that SRP will be subjected to increasingly stringent safety and health requirements in future years. Revised safety and health expenditures for corrective actions are $200 million per year (FY 1992 - 1995) including new initiatives in addition to the $350 million mortgage for pre-FY 1991 initiatives.

TABLE 1
SAVANNAH RIVER PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	62.0	67.0	67.0	75.0	68.0	70.0	73.0	75.0
Corrective Actions								
Air	2.0	0.0	8.0	13.0	10.0	16.0	6.0	8.0
Water	11.0	8.0	25.0	48.0	35.0	15.0	10.0	10.0
Solid Waste Management	29.0	41.0	49.0	27.0	52.0	54.0	45.0	79.0
Remedial Action	18.0	44.0	70.0	50.0	66.0	43.0	12.0	29.0
Subtotal, Environment	122.0	160.0	219.0	213.0	231.0	198.0	146.0	201.0
SAFETY AND HEALTH:								
Base Program	106.0	118.0	130.0	135.0	135.0	135.0	135.0	135.0
Corrective Actions								
Nuclear Reactor	34.0	52.0	62.0	84.0	100.0	100.0	100.0	100.0
Non-Reactor Nuclear	4.0	4.0	5.0	28.0	55.0	55.0	55.0	55.0
Non-Nuclear	10.0	9.0	9.0	42.0	45.0	45.0	45.0	45.0
Subtotal, Safety and Health	154.0	183.0	206.0	289.0	335.0	335.0	335.0	335.0
TOTAL ES&H	276.0	343.0	425.0	502.0	566.0	533.0	481.0	536.0

TABLE 2

SAVANNAH RIVER PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	1	5
Water	2	5
Solid Waste Management	2	5
Remedial Action	2	15
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	5	10
Non-Reactor Nuclear	5	10
Non-Nuclear	5	10

TABLE 3

SAVANNAH RIVER PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	349	7,000(1)
Safety and Health	800	1,800
Total ES&H	1,149	8,800

(1) Does not include remedial actions associated with off-site contamination, beyond continued monitoring of situation.

Environment, Safety and Health Report for the Department of Energy Defense Complex

- - - - Executive Summary - - - -

by

The United States Department of Energy

July 1, 1988

Funding projections shown in this report are provided as one example of how environment, safety, and health activities could be accomplished. This information was supplied by the individual sites. When additional information is available on specific projects, the projects will then be validated and prioritized Department-wide as well as factored into the overall missions and goals. This may result in different funding profiles than are presented here. The resources exceed funding currently included in the Budget Target for FY 1990-1995 for such activities and consequently DO NOT REPRESENT AN ADMINISTRATION POSITION/PROPOSAL.

EXECUTIVE SUMMARY

OVERVIEW

This environment, safety, and health report for the U. S. Department of Energy's (DOE) defense complex provides a summary of current and projected activities and the associated resources that will be necessary to clean up environmental contamination and to achieve and maintain compliance with environment, safety, and health requirements. It reflects the best data available as part of the Department's continuing process to address current requirements and problems.

The report addresses the Department's Defense Programs sites and facilities only. Other Departmental environment, safety, and health efforts will be consolidated with these sites and facilities into one report to be issued in December 1988.

Due to uncertainties in the nature, scope, and magnitude of cleanup and compliance activities, particularly beyond FY 1995, the report provides two scenarios of time and resources needed to meet current requirements. Both scenarios, "Expected" and "High", are unconstrained by resources but reflect the range of interpretations that could be applied to existing statutes, regulations, and policies. The "Expected" projection represents each site's independent judgment of what activities and resources are most likely to be necessary to meet existing requirements. The "Expected" projection is not a minimum requirements case; rather, it represents the most likely requirements given the unique characteristics of each site. The "High" projection represents each site's judgment of what activities and resources could be required to meet more stringent interpretations of those existing statutes, regulations, and policies that could reasonably be imposed upon the sites. Within those bounds, the cleanup of contaminated sites and corrective actions could require between $40 billion and $70 billion in addition to an ongoing base program of $700 million per year.

This report identifies "needs" and as such, will be used to formulate long-range plans. The decision to adopt the activities and resource profiles implicit in this report has not been made. When a decision is made, completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal budget process. The total resource projections are only illustrative of the magnitude that could be required to accomplish the cleanup and compliance activities within the time frames noted in the report.

MAJOR CHALLENGES

Most of today's defense complex facilities were designed and constructed in the 1940s and 1950s. Since that time, increasingly stringent requirements have been applied. In the safety and health area, the Department is continuing its evaluation of facility safety to assure acceptable margins of safety.

In the environmental area, waste management requirements are now more stringent than in the past. Today's standards require remedial investigation of old waste disposal and spill sites at many DOE defense complex facilities. In addition, each site's situation is unique, requiring site-specific investigation and selection of remedy. The volumes of waste to be addressed can vary significantly between sites, depending on initial site operations and technologies utilized in those operations. For example, the Hanford Site has up to 15 times the volume of waste to be addressed than that at the Savannah River Plant.

The large number of requirements emanating from extensive environmental legislation and the additional emphasis placed on safety and health are being applied to defense complex facilities at a time of considerable budgetary restraint. This poses a major challenge for DOE, the Congress, and the Nation.

ACTIONS

Since 1985, the Secretary of Energy has introduced several environment, safety, and health initiatives. These included strengthening the role and staffing of the Department's environment, safety, and health oversight organization, issuance of an Environmental Policy Statement and a companion Safety and Health Policy Statement, conducting the Environmental Survey of DOE sites and the Technical Safety Appraisals of DOE facilities, and developing the plans necessary to respond effectively to the findings of these activities. Subsequent to a review of the Department's production reactors conducted at the Department's request by the National Academy of Sciences, the Secretary promptly initiated independent safety oversight of Departmental nuclear facility programs and institutionalized it through establishment of the Advisory Committee on Nuclear Facility Safety. DOE offices are developing plans necessary to effect efficient independent oversight of DOE nuclear facilities. Concurrent with these initiatives, the DOE defense complex established a six-step planning and implementation process. That process is evolving and has established a disciplined regimen for identifying necessary actions.

At each site, environment, safety, and health activities are an integral part of day-to-day operations. This basic effort includes the activities and personnel required for operation of related equipment; monitoring of conditions; administrative controls and reports; environmental impact assessments; operational and facility safety, such as fire protection and medical assistance; and other infrastructure required for continuing viable operations at each site. These efforts will continue at each site, exclusive of the need for additional clean up or compliance activities. To address the cleanup and compliance of sites, the identification, planning, and execution of corrective actions will be necessary.

In the environmental area, corrective actions to address current requirements have been categorized into four areas: Air, Water, Solid Waste Management, and Remedial Action. These categories capture the variety of activities

necessary to comply with specific requirements of the Clean Air Act; the Clean Water Act; the Toxic Substances Control Act; the Safe Drinking Water Act; the Resource Conservation and Recovery Act; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and its amendment, the Superfund Amendments and Reauthorization Act.

All sites are actively addressing environmental concerns related to ongoing operations. Most of the needed corrective actions can be completed within a 5 to 10 year timeframe, if adequate funds are made available. Efforts to clean up contaminated sites, which are mainly in the assessment stages, will be conducted in accordance with CERCLA requirements. If adequate funds are made available, remedial actions at most sites could be completed within 20 years. However, remedial actions at several sites may extend beyond FY 2010 due to the nature, scope, and magnitude of the identified environmental contamination. (See Figure ES-1.)

The focus of environmental activities at the majority of sites will be in the Solid Waste Management and Remedial Action categories to address the management of mixed wastes and the cleanup of contaminated areas. For the management of mixed wastes, the Department's defense complex facilities are entering into Consent Orders and Compliance Agreements with the Environmental Protection Agency and state regulatory agencies regarding the treatment, storage, and disposal of mixed waste. In many instances, special procedures will be necessary to assure proper radiation protection in mixed waste handling operations. To address environmental contamination, the primary objective of the environmental restoration activity at DOE defense complex sites is to select the appropriate remedy for the spill sites and inactive waste sites. To this end, the Department recently reached agreement with the Environmental Protection Agency on model provisions for Federal Facility Agreements to be negotiated under the Comprehensive Environmental Response, Compensation and Liability Act.

In the Safety and Health area, corrective actions necessary to address current requirements have been categorized into three areas: Nuclear Reactor facilities; Non-Reactor Nuclear facilities; and Non-Nuclear facilities. These categories reflect the three broad types of facilities in which the Department must assure the safety and health of the public and of the workers through compliance with specific DOE Orders and prudent operating practices.

Most sites project completion of safety and health corrective actions within 5 to 10 years in all three facility categories, if adequate funds are made available. However, if a higher level of activity were required, corrective actions at Nuclear Reactor facilities could extend beyond FY 2000 at 2 sites while corrective actions at Non-Reactor and Non-Nuclear facilities could extend beyond FY 2010 at one site. (See Figure ES-2.)

The major focus of safety and health activities will be on upgrading nuclear reactor safety, improving fire protection, and improving radiological health protection. The DOE defense complex nuclear production reactors are continually evaluated by both line management and independent organizations to assure that they are operated in a safe manner. Several reactor improvement programs are being implemented to better define or enhance the

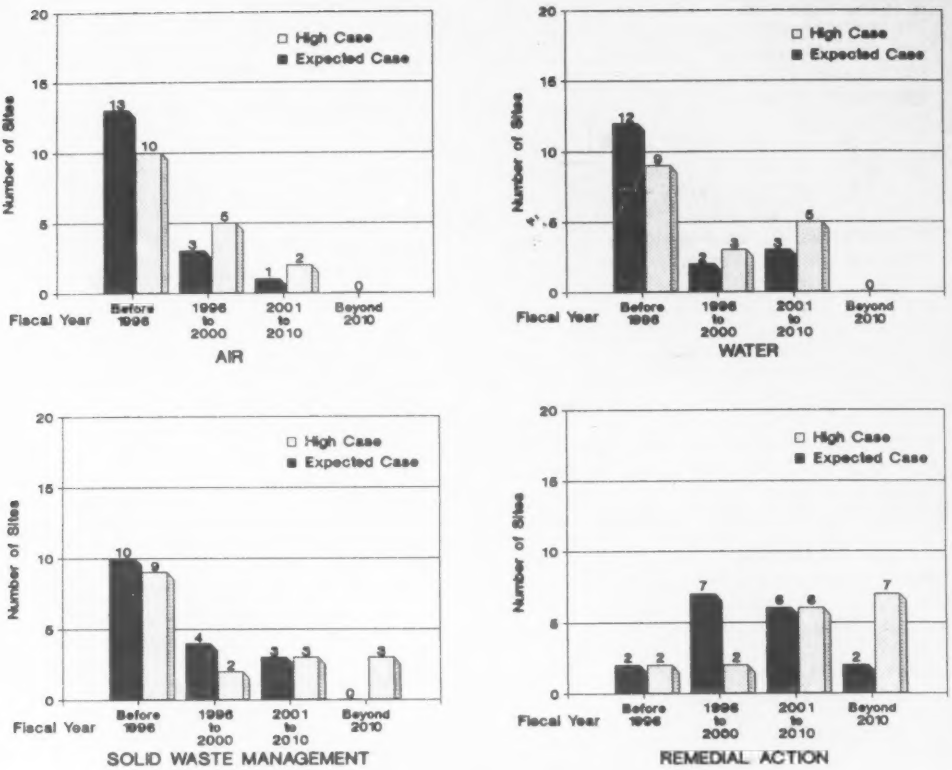

Figure ES-1:
DOE Defense Complex; Number of Sites Completing
Environmental Corrective Actions

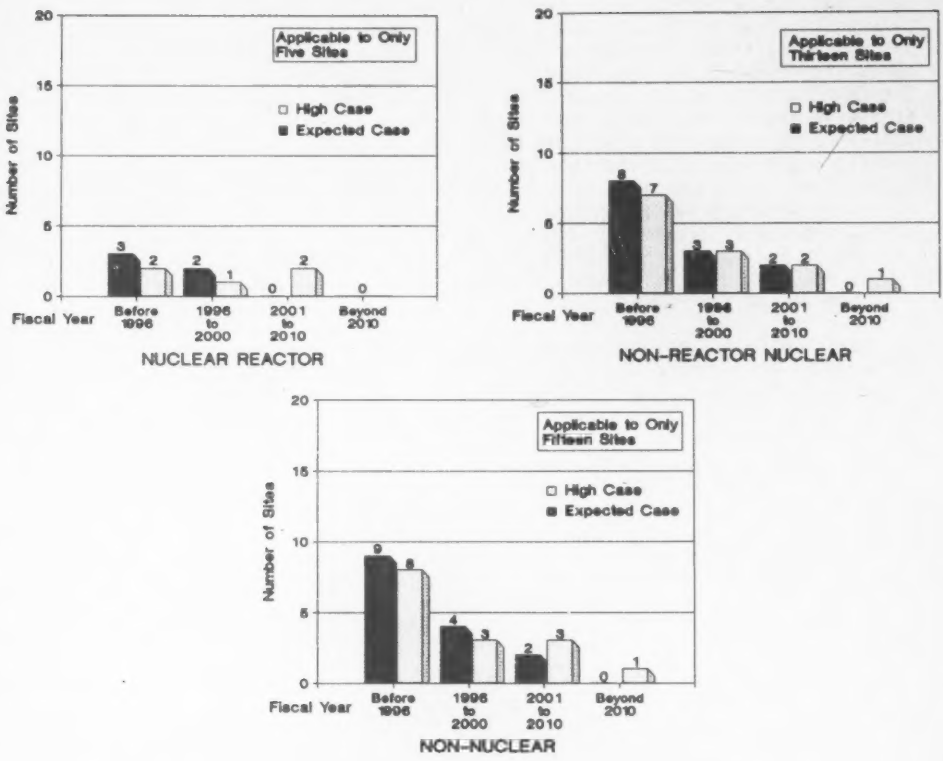

Figure ES-2:
DOE Defense Complex; Number of Sites Completing
Safety and Health Corrective Actions

margin of safety in these facilities. These include improved confinement systems, new reactor monitoring systems, and upgraded emergency cooling systems. The Factory Mutual Research Corporation (FMRC) is independently conducting fire protection survey audits at DOE defense complex facilities. The FMRC recommendations support the insurance industry's philosophy of providing engineered fire protection and prevention. The Department continues to update its practices to reflect generally recognized good operating procedures in its fire protection and prevention activities. Radiological health protection at DOE defense complex facilities is designed to ensure that all radiation exposures are maintained at levels which do not exceed applicable limits and with the objective that they be as low as reasonably achievable. Radiation controls include administrative procedures, engineered systems, protective equipment, and state-of-the-art nuclear instrumentation.

Accomplishment of these objectives will require a significant investment sustained over a number of years. A potential range of the cost projections is given in the following table and figures (see Figure ES-3 and Figure ES-4). The $26 to $40 billion range for the environment, and safety and health base program is a consolidation of these efforts over the number of years necessary to complete all corrective actions under the "Expected" and "High" scenarios. These costs would be required independent of the need for corrective actions and would continue each year thereafter. The $40 to $70 billion range for corrective actions is only to meet current requirements. New legislative, regulatory, or policy requirements would be additive, both in time and resources to the projections of this report.

TOTAL PROJECTED COSTS
(Billions of FY 1990 Dollars)

	"Expected" Through FY 2025	"High" Through FY 2045
Base Program	26	40
Corrective Actions:		
Environment	37	65
Safety & Health	3	5
Subtotal	40	70
TOTAL ES&H	66	110

However, as previously stated, this report identifies "needs" and as such, will be used to formulate long-range plans. The decision to adopt the activities and resource profiles implicit in this report has not been made. When a decision is made, completion of the corrective actions will be determined ultimately through the review and prioritization of these and other mission objectives of the Department within the annual Federal budget process. The total resource projections are only illustrative of the magnitude that could be required to accomplish the clean up and compliance activities within the time frames noted in the report.

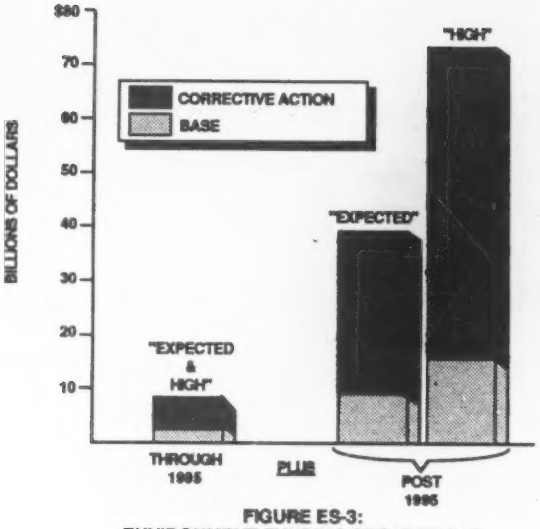

FIGURE ES-3:
ENVIRONMENT FUNDING PROJECTIONS

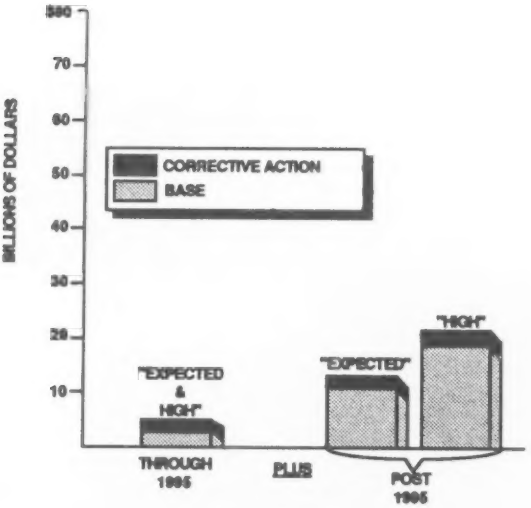

FIGURE ES-4:
SAFETY AND HEALTH FUNDING PROJECTIONS

Supplement

Environment, Safety and Health Report for the Portsmouth Gaseous Diffusion Plant

by

The United States Department of Energy

July 1, 1988

SUMMARY OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT ENVIRONMENT, SAFETY AND HEALTH (ES&H) PLAN 1988

I. SITE MISSION

The primary mission of the Portsmouth Gaseous Diffusion Plant, located in Piketon, Ohio, and administered by the Oak Ridge Operations Office, is to produce enriched uranium to meet commercial and government needs, both domestic and foreign.

II. KEY AREAS OF ES&H FOCUS

The following key areas are identified for ES&H corrective actions at the Portsmouth site.

Minimization of Air Pollution Emissions

The following line item projects are identified as necessary in order to ensure that atmospheric emissions are minimized, the Clean Air Act is fully complied with, and DOE requirements are maintained:

- Improved Uranium Hexafluoride Containment ($9.0 million), and
- Halogen Emission Reduction ($15.0 million).

Full Compliance with the Clean Water Act

The following projects are identified to comply with the Clean Water Act and to meet proposed effluent limitations:

- Utilities Upgrading Phase III ($8.4 million),
- NPDES Compliance ($11.2 million),
- Elimination of Chromium Effluents ($5.0 million), and
- X-705 Decontamination Building Improvements ($3.4 million).

Protection of Personnel and Environment from Hazardous, Radioactive, and Mixed Wastes

The goal of the Portsmouth site is to comply with all regulations, to minimize hazardous, radioactive, and mixed wastes produced, to protect personnel and the environment from hazards associated with the wastes,

and to minimize long-term risks and liabilities from waste disposal. The following projects have been identified to achieve these goals:

- o Chlorinated Solvents Elimination ($2.0 million),
- o Calcination of X-705 Raffinates ($2.0 million), and

Remedial Actions at Hazardous Waste Disposal/Spill Sites

In accordance with DOE policy, the Portsmouth Plant is evaluating and identifying potential problems associated with hazardous waste disposal/spill sites. Action by the Portsmouth Plant involves mitigating existing surface and subsurface water contamination problems and meeting expected requirements of the Ohio Environmental Protection Agency. Construction and line item projects are identified to reduce or eliminate the potential hazards related to disposal/spill sites:

- o Elimination of Process Building PCB Contamination ($38.0 million),
- o Remedial Actions ($35.0 million),
- o X-750 Gas Storage Upgrade ($0.6 million), and
- o Hazardous Waste Disposal/Spill Site Closures ($2.7 million).

Nuclear Facility Safety Training Requirements

The Portsmouth site is conducting an expanded plant-wide training program in Nuclear Facility Safety in order to meet DOE requirements.

Protection of the Safety and Health of the Public and Employees

Compliance with DOE and other regulations must be accomplished to assure the protection of the public and employees. The Portsmouth Plant has well-established health and safety organizations to ensure compliance with regulations. Deficiencies and corrective actions have been identified.

III. ES&H RESOURCE PROJECTIONS

The following tables present a summary of the ES&H resource projects for the Portsmouth Gaseous Diffusion Plant. The summary incorporates the base program and all corrective actions, including those discussed in the key areas of focus.

The remedial action strategy involves a combination of waste removal and closure in place coupled with groundwater quality restoration. The difference between the "expected" and "high" projections presented in Tables 2 and 3 is associated with uncertainties in the scope of groundwater contamination, the waste treatment methods that will be required, and the actual groundwater remediation criteria that will be utilized.

TABLE 1
PORTSMOUTH GASEOUS DIFFUSION PLANT
ES&H RESOURCE PROJECTIONS
(millions of dollars)

	FISCAL YEAR							
	88	89	90	91	92	93	94	95
ENVIRONMENT:								
Base Program	9.7	12.1	12.9	12.9	12.9	12.9	12.9	12.9
Corrective Actions								
Air	0.2	0.0	0.0	0.0	0.0	0.0	3.0	5.0
Water	0.0	0.0	0.0	0.0	3.0	13.2	0.0	0.0
Solid Waste Management	1.2	2.3	0.4	0.0	2.0	2.0	0.0	0.0
Remedial Action	7.3	8.0	4.0	11.8	38.8	12.8	12.8	10.8
Subtotal, Environment	18.4	22.4	17.3	24.7	56.7	40.9	28.7	28.7
SAFETY AND HEALTH:								
Base Program	9.2	10.4	11.4	14.6	14.3	14.1	14.1	14.1
Corrective Actions								
Nuclear Reactor	NA	NA	NA	NA	NA	NA	NA	NA
Non-Reactor Nuclear	1.9	4.7	8.4	0.4	0.3	0.0	0.3	0.0
Non-Nuclear	1.8	0.2	0.0	0.0	0.5	0.5	0.0	0.0
Subtotal, Safety and Health	12.9	15.3	19.8	15.0	15.1	14.6	14.4	14.1
TOTAL ES&H	31.3	37.7	37.1	39.7	71.8	55.5	43.1	42.8

NA - Not Applicable

TABLE 2

PORTSMOUTH GASEOUS DIFFUSION PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
(IN YEARS)

	Number of Years Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
ENVIRONMENT:		
Corrective Actions		
Air	4	5
Water	5	5
Solid Waste Management	5	5
Remedial Action	5	5
SAFETY AND HEALTH:		
Corrective Actions		
Nuclear Reactor	NA	NA
Non-Reactor Nuclear	0	5
Non-Nuclear	5	5

NA - Not Applicable

TABLE 3

PORTSMOUTH GASEOUS DIFFUSION PLANT
POST FY 1995 ES&H RESOURCE PROJECTIONS
($ IN MILLIONS)

	Resource Projections Beyond FY 1995 to Complete Corrective Actions	
	Expected	High
Environment	24	198
Safety and Health	4	98
Total ES&H	28	296